UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

May 28, 2015

Mr. Mano Nazar
President and Chief Nuclear Officer
Nuclear Division
NextEra Energy
P.O. Box 14000
Juno Beach, FL 33408-0420

SUBJECT: TURKEY POINT NUCLEAR GENERATING UNIT NOS. 3 AND 4 – ISSUANCE OF AMENDMENTS REGARDING TRANSITION TO A RISK-INFORMED, PERFORMANCE-BASED FIRE PROTECTION PROGRAM IN ACCORDANCE WITH TITLE 10 OF THE CODE OF FEDERAL REGULATIONS SECTION 50.48(c) (TAC NOS. ME8990 AND ME8991)

Dear Mr. Nazar:

The U.S. Nuclear Regulatory Commission (NRC or the Commission) has issued the enclosed Amendment No. 262 to Renewed Facility Operating License (RFOL) No. DPR-31 and Amendment No. 257 to RFOL No. DPR-41 for the Turkey Point Nuclear Generating Unit Nos. 3 and 4, respectively. The amendments change the RFOLs and Technical Specifications (TSs) in response to Florida Power & Light Company's (the licensee's) application dated June 28, 2012, as supplemented by letters dated September 19, 2012; March 18, April 16, and May 15, 2013; January 7, April 4, June 6, July 18, September 12, November 5, and December 2, 2014; and February 18, 2015.

The amendments modify the RFOLs and TSs to incorporate a new fire protection licensing basis in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.48(c). The amendments authorize the transition of the licensee's fire protection program to a risk-informed and performance-based program based on the 2001 Edition of National Fire Protection Association Standard 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants." This standard describes how to use performance-based methods, such as fire modeling, and risk-informed methods, such as fire probabilistic risk assessment, to demonstrate compliance with nuclear safety performance criteria.

The amendments revise the fire protection license condition in the RFOLs. As a result of placing the new license condition in the RFOLs, the NRC is issuing additional pages caused by the repagination of subsequent license pages.

The NRC staff's safety evaluation of the amendments is enclosed. A Notice of Issuance will be included in the Commission's biweekly *Federal Register* notice.

Sincerely,

Audrey L. Klett, Project Manager
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-250 and 50-251

Enclosures:
1. Amendment No. 262 to DPR-31
2. Amendment No. 257 to DPR-41
3. Safety Evaluation

cc w/enclosures: Distribution via Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

FLORIDA POWER & LIGHT COMPANY

DOCKET NO. 50-250

TURKEY POINT NUCLEAR GENERATING UNIT NO. 3

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 262
Renewed License No. DPR-31

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Florida Power & Light Company (the licensee) dated June 28, 2012, as supplemented by letters dated September 19, 2012; March 18, April 16, and May 15, 2013; January 7, April 4, June 6, July 18, September 12, November 5, and December 2, 2014; and February 18, 2015, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act) and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Operating License and Technical Specifications as indicated in the attachment to this license amendment, and paragraph 3.B of Renewed Facility Operating License No. DPR-31 is hereby amended to read as follows:

   B. Technical Specifications

   The Technical Specifications contained in Appendix A, as revised through Amendment No. 262 are hereby incorporated into this renewed license. The Environmental Protection Plan contained in Appendix B is hereby incorporated into this renewed license. The licensee shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of its date of issuance and shall be implemented as described in the transition license conditions.

FOR THE NUCLEAR REGULATORY COMMISSION

Shana R. Helton

Shana R. Helton, Chief
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Operating License and
Technical Specifications

Date of Issuance: May 28, 2015

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

FLORIDA POWER & LIGHT COMPANY

DOCKET NO. 50-251

TURKEY POINT NUCLEAR GENERATING UNIT NO. 4

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 257
Renewed License No. DPR-41

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Florida Power & Light Company (the licensee) dated June 28, 2012, as supplemented by letters dated September 19, 2012; March 18, April 16, and May 15, 2013; January 7, April 4, June 6, July 18, September 12, November 5, and December 2, 2014; and February 18, 2015, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act) and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Operating License and Technical Specifications as indicated in the attachment to this license amendment, and paragraph 3.B of Renewed Facility Operating License No. DPR-41 is hereby amended to read as follows:

   B. Technical Specifications

   The Technical Specifications contained in Appendix A, as revised through Amendment No. 257 are hereby incorporated into this renewed license. The Environmental Protection Plan contained in Appendix B is hereby incorporated into this renewed license. The licensee shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of its date of issuance and shall be implemented as described in the transition license conditions.

FOR THE NUCLEAR REGULATORY COMMISSION

Shana R. Helton

Shana R. Helton, Chief
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Operating License and
Technical Specifications

Date of Issuance: May 28, 2015

ATTACHMENT TO LICENSE AMENDMENTS

AMENDMENT NO. 262 RENEWED FACILITY OPERATING LICENSE NO. DPR-31

AMENDMENT NO. 257 RENEWED FACILITY OPERATING LICENSE NO. DPR-41

DOCKET NOS. 50-250 AND 50-251

Replace pages 3, 4, 5, and 6 of Renewed Facility Operating License DPR-31 with the attached pages 3, 4, 5, 6, 7, and 8. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Replace pages 3, 4, 5, and 6 of Renewed Facility Operating License DPR-41 with the attached pages 3, 4, 5, 6, 7, and 8. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Replace the following page of the Appendix A Technical Specifications with the attached page. The revised page is identified by amendment number and contains marginal lines indicating the areas of change.

Remove	Insert
6-5	6-5

E. Pursuant to the Act and 10 CFR Parts 40 and 70 to receive, possess, and use at any time 100 milligrams each of any source or special nuclear material without restriction to chemical or physical form, for sample analysis or instrument calibration or associated with radioactively contaminated apparatus;

F. Pursuant to the Act and 10 CFR Parts 30 and 70, to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of Turkey Point Units Nos. 3 and 4.

3. This renewed operating license shall be deemed to contain and is subject to the conditions specified in the following Commission regulations: 10 CFR Part 20, Section 30.34 of 10 CFR Part 30, Section 40.41 of 10 CFR Part 40, Sections 50.54 and 50.59 of 10 CFR Part 50, and Section 70.32 of 10 CFR Part 70; and is subject to all applicable provisions of the Act and to the rules, regulations, and orders of the Commission now or hereafter in effect, and is subject to the additional conditions specified below:

A. Maximum Power Level

The applicant is authorized to operate the facility at reactor core power levels not in excess of 2644 megawatts (thermal).

B. Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 262 are hereby incorporated into this renewed license. The Environmental Protection Plan contained in Appendix B is hereby incorporated into this renewed license. The licensee shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

C. Final Safety Analysis Report

The licensee's Final Safety Analysis Report supplement submitted pursuant to 10 CFR 54.21(d), as revised on November 1, 2001, describes certain future inspection activities to be completed before the period of extended operation. The licensee shall complete these activities no later than July 19, 2012.

The Final Safety Analysis Report supplement as revised on November 1, 2001, described above, shall be included in the next scheduled update to the Final Safety Analysis Report required by 10 CFR 50.71(e)(4), following the issuance of this renewed license. Until that update is complete, the licensee may make changes to the programs described in such supplement without prior Commission approval, provided that the licensee evaluates each such change pursuant to the criteria set forth in 10 CFR 50.59 and otherwise complies with the requirements in that section.

D. Fire Protection

FPL shall implement and maintain in effect all provisions of the approved fire protection program that comply with 10 CFR 50.48(a) and 10 CFR 50.48(c), as specified in the licensee amendment request dated June 28, 2012 (and supplements dated September 19, 2012; March 18, April 16, and May 15, 2013; January 7, April 4, June 6, July 18, September 12, November 5, and December 2, 2014; and February 18, 2015), and as approved in the safety evaluation dated May 28, 2015. Except where NRC approval for changes or deviations is required by 10 CFR 50.48(c), and provided no other regulation, technical specification, license condition or requirement would require prior NRC approval, the licensee may make changes to the fire protection program without prior approval of the Commission if those changes satisfy the provisions set forth in 10 CFR 50.48(a) and 10 CFR 50.48(c), the change does not require a change to a technical specification or a license condition, and the criteria listed below are satisfied.

Risk-Informed Changes that May Be Made Without Prior NRC Approval

A risk assessment of the change must demonstrate that the acceptance criteria below are met. The risk assessment approach, methods, and data shall be acceptable to the NRC and shall be appropriate for the nature and scope of the change being evaluated; be based on the as-built, as-operated, and maintained plant; and reflect the operating experience at the plant. Acceptable methods to assess the risk of the change may include methods that have been used in the peer-reviewed fire PRA model, methods that have been approved by NRC through a plant-specific license amendment or NRC approval of generic methods specifically for use in NFPA 805 risk assessments, or methods that have been demonstrated to bound the risk impact.

(a) Prior NRC review and approval is not required for changes that clearly result in a decrease in risk. The proposed change must also be consistent with the defense-in-depth philosophy and must maintain sufficient safety margins. The change may be implemented following completion of the plant change evaluation.

(b) Prior NRC review and approval is not required for individual changes that result in a risk increase less than 1×10^{-7}/year (yr) for CDF and less than 1×10^{-8}/yr for LERF. The proposed change must also be consistent with the defense-in-depth philosophy and must maintain sufficient safety margins. The change may be implemented following completion of the plant change evaluation.

Other Changes that May Be Made Without Prior NRC Approval

1. Changes to NFPA 805, Chapter 3, Fundamental Fire Protection Program

   Prior NRC review and approval are not required for changes to the NFPA 805, Chapter 3, fundamental fire protection program elements and design requirements for which an engineering evaluation demonstrates that the alternative to the Chapter 3 element is functionally equivalent or adequate for the hazard. The licensee may use an engineering evaluation to demonstrate that a change to an NFPA 805, Chapter 3, element is functionally equivalent to the corresponding technical requirement. A qualified fire protection engineer shall perform the engineering evaluation and conclude that the change has not affected the functionality of the component, system, procedure, or physical arrangement, using a relevant technical requirement or standard.

   The licensee may use an engineering evaluation to demonstrate that changes to certain NFPA 805, Chapter 3, elements are acceptable because the alternative is "adequate for the hazard." Prior NRC review and approval would not be required for alternatives to four specific sections of NFPA 805, Chapter 3, for which an engineering evaluation demonstrates that the alternative to the Chapter 3 element is adequate for the hazard. A qualified fire protection engineer shall perform the engineering evaluation and conclude that the change has not affected the functionality of the component, system, procedure, or physical arrangement, using a relevant technical requirement or standard. The four specific sections of NFPA 805, Chapter 3, are as follows:

   - "Fire Alarm and Detection Systems" (Section 3.8);
   - "Automatic and Manual Water-Based Fire Suppression Systems" (Section 3.9);
   - "Gaseous Fire Suppression Systems" (Section 3.10); and
   - "Passive Fire Protection Features" (Section 3.11).

   This License Condition does not apply to any demonstration of equivalency under Section 1.7 of NFPA 805.

2. Fire Protection Program Changes that Have No More than Minimal Risk Impact

   Prior NRC review and approval are not required for changes to the licensee's fire protection program that have been demonstrated to have no more than a minimal risk impact. The licensee may use its screening process as approved in the NRC safety evaluation dated May 28, 2015, to determine that certain fire protection program changes meet the minimal criterion. The licensee shall ensure that fire protection defense-in-depth and safety margins are maintained when changes are made to the fire protection program.

Transition License Conditions

1. Before achieving full compliance with 10 CFR 50.48(c), as specified by 2. and 3. below, risk-informed changes to the licensee's fire protection program may not be made without prior NRC review and approval unless the change has been demonstrated to have no more than a minimal risk impact, as described in 2. above.

2. The licensee shall implement the modifications to its facility, as described in Enclosure 1, Attachment S, Table S-2, "Plant Modifications Committed," of FPL letter L-2014-303, dated November 5, 2014, to complete the transition to full compliance with 10 CFR 50.48(c) by the end of the second refueling outage (for each unit) following issuance of the license amendment. The licensee shall maintain appropriate compensatory measures in place until completion of these modifications.

3. The licensee shall implement the items listed in Enclosure 1, Attachment S, Table S-3, "Implementation Items," of FPL letter L-2014-303, dated 11/05/2014, with the exception of Items 12, 18, 19, and 22, no later than 12 months after issuance of the license amendment. Items 12, 18 and 19 are associated with modifications in Table S-2 and will be completed in accordance with Transition License Condition 2 above. Item 22 will be completed within 6 months of the NRC approval of the Flowserve RCP Seal Topical Report.

E. The licensee shall fully implement and maintain in effect all provisions of the Commission-approved physical security, training and qualification, and safeguards contingency plans including amendments made pursuant to provision of the Miscellaneous Amendments and Search Requirements revisions to 10 CFR 73.55 (51 FR 27817 and 27822) and to the authority of 10 CFR 50.90 and 10 CFR 50.54(p). The combined set of plans, which contains Safeguards Information protected under 10 CFR 73.21, is entitled: "Florida Power and Light Turkey Point Nuclear Plant Physical Security Plan, Training and Qualification Plan, Safeguards Contingency Plan, and Independent Spent Fuel Storage Installation Security Program - Revision 15" submitted by letter dated August 3, 2012.

The licensee shall fully implement and maintain in effect all provisions of the Commission-approved cyber security plan (CSP), including changes made pursuant to the authority of 10 CFR 50.90 and 10 CFR 50.54(p). The Turkey Point Nuclear Generating Station CSP was approved by License Amendment No. 245 as supplemented by a change approved by Amendment No. 256.

F. 1. The licensee shall restrict the combined number of fuel assemblies loaded in the existing spent fuel pool storage racks and cask pit rack to no more than the capacity of the spent fuel pool storage racks. This condition applies at all times, except during activities associated with a reactor core offload/reload refueling condition. This restriction will ensure the capability to unload and remove the cask pit rack when cask loading operations are necessary.

2. The licensee shall establish two hold points within the rack installation procedure to ensure proper orientation of the cask rack in each unit's spent fuel pool. Verification of proper cask pit rack orientation will be implemented by an authorized Quality Control inspector during installation of the racks to ensure consistency with associated spent fuel pool criticality analysis assumptions.

G. Mitigation Strategy License Condition

Develop and maintain strategies for addressing large fires and explosions and that include the following key areas:

(a) Fire fighting response strategy with the following elements:

1. Pre-defined coordinated fire response strategy and guidance
2. Assessment of mutual aid fire fighting assets
3. Designated staging areas for equipment and materials
4. Command and control
5. Training of response personnel

(b) Operations to mitigate fuel damage considering the following

1. Protection and use of personnel assets
2. Communications
3. Minimizing fire spread
4. Procedures for implementing integrated fire response strategy
5. Identification of readily-available pre-staged equipment
6. Training on integrated fire response strategy
7. Spent fuel pool mitigation measures

(c) Actions to minimize release to include consideration of:

1. Water spray scrubbing
2. Dose to onsite responders

H. PAD TCD Safety Analyses

1. PAD 4.0 TCD has been specifically approved for use for the Turkey Point licensing basis analyses. Upon NRC's approval of a revised generic version of PAD that accounts for Thermal Conductivity Degradation (TCD), FPL will within six months:

   a. Demonstrate that PAD 4.0 TCD remains conservatively bounding in licensing basis analyses when compared to the new generically approved version of PAD w/TCD, or
   b. Provide a schedule for the re-analysis using the new generically approved version of PAD w/TCD for any of the affected licensing basis analyses.

4. This renewed license is effective as of the date of issuance, and shall expire at midnight July 19, 2032.

FOR THE NUCLEAR REGULATORY COMMISSION

Signed by
Samuel J. Collins, Director
Office of Nuclear Reactor Regulation

Attachments:
Appendix A – Technical Specifications for Unit 3
Appendix B – Environmental Protection Plan

Date of Issuance: June 6, 2002

E. Pursuant to the Act and 10 CFR Parts 40 and 70 to receive, possess, and use at any time 100 milligrams each of any source or special nuclear material without restriction to chemical or physical form, for sample analysis or instrument calibration or associated with radioactively contaminated apparatus;

F. Pursuant to the Act and 10 CFR Parts 30 and 70, to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of Turkey Point Units Nos. 3 and 4.

3. This renewed operating license shall be deemed to contain and is subject to the conditions specified in the following Commission regulations: 10 CFR Part 20, Section 30.34 of 10 CFR Part 30, Section 40.41 of 10 CFR Part 40, Sections 50.54 and 50.59 of 10 CFR Part 50, and Section 70.32 of 10 CFR Part 70; and is subject to all applicable provisions of the Act and to the rules, regulations, and orders of the Commission now or hereafter in effect, and is subject to the additional conditions specified below:

A. Maximum Power Level

The applicant is authorized to operate the facility at reactor core power levels not in excess of 2644 megawatts (thermal).

B. Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 257 are hereby incorporated into this renewed license. The Environmental Protection Plan contained in Appendix B is hereby incorporated into this renewed license. The licensee shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

C. Final Safety Analysis Report

The licensee's Final Safety Analysis Report supplement submitted pursuant to 10 CFR 54.21(d), as revised on November 1, 2001, describes certain future inspection activities to be completed before the period of extended operation. The licensee shall complete these activities no later than April 10, 2013.

The Final Safety Analysis Report supplement as revised on November 1, 2001, described above, shall be included in the next scheduled update to the Final Safety Analysis Report required by 10 CFR 50.71(e)(4), following the issuance of this renewed license. Until that update is complete, the licensee may make changes to the programs described in such supplement without prior Commission approval, provided that the licensee evaluates each such change pursuant to the criteria set forth in 10 CFR 50.59 and otherwise complies with the requirements in that section.

D. Fire Protection

FPL shall implement and maintain in effect all provisions of the approved fire protection program that comply with 10 CFR 50.48(a) and 10 CFR 50.48(c), as specified in the licensee amendment request dated June 28, 2012 (and supplements dated September 19, 2012; March 18, April 16, and May 15, 2013; January 7, April 4, June 6, July 18, September 12, November 5, and December 2, 2014; and February 18, 2015), and as approved in the safety evaluation dated May 28, 2015. Except where NRC approval for changes or deviations is required by 10 CFR 50.48(c), and provided no other regulation, technical specification, license condition or requirement would require prior NRC approval, the licensee may make changes to the fire protection program without prior approval of the Commission if those changes satisfy the provisions set forth in 10 CFR 50.48(a) and 10 CFR 50.48(c), the change does not require a change to a technical specification or a license condition, and the criteria listed below are satisfied.

Risk-Informed Changes that May Be Made Without Prior NRC Approval

A risk assessment of the change must demonstrate that the acceptance criteria below are met. The risk assessment approach, methods, and data shall be acceptable to the NRC and shall be appropriate for the nature and scope of the change being evaluated; be based on the as-built, as-operated, and maintained plant; and reflect the operating experience at the plant. Acceptable methods to assess the risk of the change may include methods that have been used in the peer-reviewed fire PRA model, methods that have been approved by NRC through a plant-specific license amendment or NRC approval of generic methods specifically for use in NFPA 805 risk assessments, or methods that have been demonstrated to bound the risk impact.

(a) Prior NRC review and approval is not required for changes that clearly result in a decrease in risk. The proposed change must also be consistent with the defense-in-depth philosophy and must maintain sufficient safety margins. The change may be implemented following completion of the plant change evaluation.

(b) Prior NRC review and approval is not required for individual changes that result in a risk increase less than 1×10^{-7}/year (yr) for CDF and less than 1×10^{-8}/yr for LERF. The proposed change must also be consistent with the defense-in-depth philosophy and must maintain sufficient safety margins. The change may be implemented following completion of the plant change evaluation.

Other Changes that May Be Made Without Prior NRC Approval

1. Changes to NFPA 805, Chapter 3, Fundamental Fire Protection Program

   Prior NRC review and approval are not required for changes to the NFPA 805, Chapter 3, fundamental fire protection program elements and design requirements for which an engineering evaluation demonstrates that the alternative to the Chapter 3 element is functionally equivalent or adequate for the hazard. The licensee may use an engineering evaluation to demonstrate that a change to an NFPA 805, Chapter 3, element is functionally equivalent to the corresponding technical requirement. A qualified fire protection engineer shall perform the engineering evaluation and conclude that the change has not affected the functionality of the component, system, procedure, or physical arrangement, using a relevant technical requirement or standard.

   The licensee may use an engineering evaluation to demonstrate that changes to certain NFPA 805, Chapter 3, elements are acceptable because the alternative is "adequate for the hazard." Prior NRC review and approval would not be required for alternatives to four specific sections of NFPA 805, Chapter 3, for which an engineering evaluation demonstrates that the alternative to the Chapter 3 element is adequate for the hazard. A qualified fire protection engineer shall perform the engineering evaluation and conclude that the change has not affected the functionality of the component, system, procedure, or physical arrangement, using a relevant technical requirement or standard. The four specific sections of NFPA 805, Chapter 3, are as follows:

   - "Fire Alarm and Detection Systems" (Section 3.8);
   - "Automatic and Manual Water-Based Fire Suppression Systems" (Section 3.9);
   - "Gaseous Fire Suppression Systems" (Section 3.10); and
   - "Passive Fire Protection Features" (Section 3.11).

   This License Condition does not apply to any demonstration of equivalency under Section 1.7 of NFPA 805.

2. Fire Protection Program Changes that Have No More than Minimal Risk Impact

   Prior NRC review and approval are not required for changes to the licensee's fire protection program that have been demonstrated to have no more than a minimal risk impact. The licensee may use its screening process as approved in the NRC safety evaluation dated May 28, 2015, to determine that certain fire protection program changes meet the minimal criterion. The licensee shall ensure that fire protection defense-in-depth and safety margins are maintained when changes are made to the fire protection program.

Transition License Conditions

1. Before achieving full compliance with 10 CFR 50.48(c), as specified by 2. and 3. below, risk-informed changes to the licensee's fire protection program may not be made without prior NRC review and approval unless the change has been demonstrated to have no more than a minimal risk impact, as described in 2. above.

2. The licensee shall implement the modifications to its facility, as described in Enclosure 1, Attachment S, Table S-2, "Plant Modifications Committed," of FPL letter L-2014-303, dated November 5, 2014, to complete the transition to full compliance with 10 CFR 50.48(c) by the end of the second refueling outage (for each unit) following issuance of the license amendment. The licensee shall maintain appropriate compensatory measures in place until completion of these modifications.

3. The licensee shall implement the items listed in Enclosure 1, Attachment S, Table S-3, "Implementation Items," of FPL letter L-2014-303, dated November 5, 2014, with the exception of Items 12, 18, 19, and 22, no later than 12 months after issuance of the license amendment. Items 12, 18 and 19 are associated with modifications in Table S-2 and will be completed in accordance with Transition License Condition 2 above. Item 22 will be completed within 6 months of the NRC approval of the Flowserve RCP Seal Topical Report.

E. The licensee shall fully implement and maintain in effect all provisions of the Commission-approved physical security, training and qualification, and safeguards contingency plans including amendments made pursuant to provision of the Miscellaneous Amendments and Search Requirements revisions to 10 CFR 73.55 (51 FR 27817 and 27822) and to the authority of 10 CFR 50.90 and 10 CFR 50.54(p). The combined set of plans, which contains Safeguards Information protected under 10 CFR 73.21, is entitled: "Florida Power and Light Turkey Point Nuclear Plant Physical Security Plan, Training and Qualification Plan, Safeguards Contingency Plan, and Independent Spent Fuel Storage Installation Security Program - Revision 15" submitted by letter dated August 3, 2012.

The licensee shall fully implement and maintain in effect all provisions of the Commission-approved cyber security plan (CSP), including changes made pursuant to the authority of 10 CFR 50.90 and 10 CFR 50.54(p). The Turkey Point Nuclear Generating Station CSP was approved by License Amendment No. 241 as supplemented by a change approved by Amendment No. 252.

F. 1. The licensee shall restrict the combined number of fuel assemblies loaded in the existing spent fuel pool storage racks and cask pit rack to no more than the capacity of the spent fuel pool storage racks. This condition applies at all times, except during activities associated with a reactor core offload/reload refueling condition. This restriction will ensure the capability to unload and remove the cask pit rack when cask loading operations are necessary.

2. The licensee shall establish two hold points within the rack installation procedure to ensure proper orientation of the cask rack in each unit's spent fuel pool. Verification of proper cask pit rack orientation will be implemented by an authorized Quality Control inspector during installation of the racks to ensure consistency with associated spent fuel pool criticality analysis assumptions.

G. Mitigation Strategy License Condition

Develop and maintain strategies for addressing large fires and explosions and that include the following key areas:

(a) Fire fighting response strategy with the following elements:

1. Pre-defined coordinated fire response strategy and guidance
2. Assessment of mutual aid fire fighting assets
3. Designated staging areas for equipment and materials
4. Command and control
5. Training of response personnel

(b) Operations to mitigate fuel damage considering the following

1. Protection and use of personnel assets
2. Communications
3. Minimizing fire spread
4. Procedures for implementing integrated fire response strategy
5. Identification of readily-available pre-staged equipment
6. Training on integrated fire response strategy
7. Spent fuel pool mitigation measures

(c) Actions to minimize release to include consideration of:

1. Water spray scrubbing
2. Dose to onsite responders

H. PAD TCD Safety Analyses

1. PAD 4.0 TCD has been specifically approved for use for the Turkey Point licensing basis analyses. Upon NRC's approval of a revised generic version of PAD that accounts for Thermal Conductivity Degradation (TCD), FPL will within six months:

   a. Demonstrate that PAD 4.0 TCD remains conservatively bounding in licensing basis analyses when compared to the new generically approved version of PAD w/TCD, or
   b. Provide a schedule for the re-analysis using the new generically approved version of PAD w/TCD for any of the affected licensing basis analyses.

4. This renewed license is effective as of the date of issuance, and shall expire at midnight April 10, 2033.

FOR THE NUCLEAR REGULATORY COMMISSION

Signed by
Samuel J. Collins, Director
Office of Nuclear Reactor Regulation

Attachments:
Appendix A – Technical Specifications for Unit 4
Appendix B – Environmental Protection Plan

Date of Issuance: June 6, 2002

6.8 PROCEDURES AND PROGRAMS

6.8.1 Written procedures shall be established, implemented, and maintained covering the activities referenced below:

a. The applicable procedures required by the Quality Assurance Topical Report.

b. The emergency operating procedures required to implement the requirements of NUREG-0737 and Supplement 1 to NUREG-0737 as stated in Generic Letter No. 82-33;

c. Process Control Program implementation;

d. Offsite Dose Calculation Manual implementation;

e. Quality Control Program for effluent monitoring using the guidance in Regulatory Guide 1.21, Revision 1, June 1974;

f. DELETED

g. Quality Control Program for environmental monitoring using the guidance in Regulatory Guide 4.1, Revision 1, April 1975; and

h. Diesel Fuel Oil Testing Program implementation.

6.8.2 DELETED

6.8.3 DELETED

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION FOR

AMENDMENT NO. 262 TO RENEWED FACILITY OPERATING LICENSE NO. DPR-31 AND

AMENDMENT NO. 257 TO RENEWED FACILITY OPERATING LICENSE NO. DPR-41

FLORIDA POWER & LIGHT COMPANY

TURKEY POINT NUCLEAR GENERATING UNIT NOS. 3 AND 4

DOCKET NOS. 50-250 AND 50-251

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION FOR AMENDMENT NO. 262 TO RENEWED FACILITY OPERATING LICENSE NO. DPR-31 AND AMENDMENT NO. 257 TO RENEWED FACILITY OPERATING LICENSE NO. DPR-41 FLORIDA POWER & LIGHT COMPANY TURKEY POINT NUCLEAR GENERATING UNIT NOS. 3 AND 4 DOCKET NOS. 50-250 AND 50-251

1.0 INTRODUCTION

1.1 Background

The U.S. Nuclear Regulatory Commission (NRC or the Commission) started developing fire protection requirements in the 1970s. In 1976, the NRC published comprehensive fire protection guidelines in the form of Branch Technical Position (BTP) Auxiliary and Power Conversion Systems Branch (APCSB) 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants" (Reference 1) and Appendix A to BTP APCSB 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants Docketed Prior to July 1, 1976" (Reference 2). Subsequently, the NRC performed fire protection reviews for the operating reactors and documented the results in safety evaluations (SEs) or supplements to SEs. In 1980, to resolve issues identified in those reports, the NRC amended its regulations for fire protection in operating nuclear power plants (NPPs) and published its Final Rule, Fire Protection Program for Operating Nuclear Power Plants, in the *Federal Register* (FR) on November 19, 1980 (45 FR 76602), adding Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.48, "Fire Protection," and Appendix R, "Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979," to 10 CFR Part 50. Section 50.48(a)(1) of 10 CFR requires each holder of an operating license and holders of a combined operating license issued under Part 52 to have a fire protection plan that satisfies General Design Criterion (GDC) 3 of Appendix A to 10 CFR Part 50 and states that the fire protection plan must describe the overall fire protection program (FPP); identify the positions responsible for the program and the authority delegated to those positions; and outline the plans for fire protection, fire detection and suppression capability, and limitation of fire damage. Section 50.48(a)(2) states that the fire protection plan must describe the specific features necessary to implement the program described in paragraph (a)(1), including administrative controls and personnel requirements for fire prevention and manual suppression activities; automatic and manual fire detection and suppression systems; and the means to limit fire damage to structures, systems, and components (SSCs) to ensure the capability to safely shut down the plant. Section 50.48(a)(3) requires that the licensee retain the fire protection plan and each change to the plan as a record until the Commission terminates the license, and that the licensee retain each superseded revision of the procedures for 3 years.

In the 1990s, the NRC worked with the National Fire Protection Association (NFPA) and industry to develop a risk-informed (RI), performance-based (PB), consensus standard for fire protection. In 2001, the NFPA Standards Council issued NFPA 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants" (Reference 3),

which describes a methodology for establishing fundamental FPP design requirements and elements, determining required fire protection systems and features, applying PB requirements, and administering fire protection for existing light water reactors during operation, decommissioning, and permanent shutdown. It provides for the establishment of a minimum set of fire protection requirements but allows PB or deterministic approaches to be used to meet performance criteria.

NRC Regulatory Guide (RG) 1.205, "Risk-Informed, Performance-Based Fire Protection for Existing Light-Water Nuclear Power Plants," Revision 1 (Reference 4), states:

> On March 26, 1998, the NRC staff sent to the Commission SECY-98-058, "Development of a Risk-Informed, Performance-Based Regulation for Fire Protection at Nuclear Power Plants" (Reference 5), in which it proposed to work with the NFPA and the industry to develop a risk-informed, performance-based consensus standard for nuclear power plant fire protection. This consensus standard could be endorsed in a future rulemaking as an alternative set of fire protection requirements to the existing regulations in 10 CFR 50.48. In SECY-00-0009, "Rulemaking Plan, Reactor Fire Protection Risk-Informed, Performance-Based Rulemaking," dated January 13, 2000 (Reference 6), the NRC staff requested and received Commission approval to proceed with rulemaking to permit operating reactor licensees to adopt an NFPA standard as an alternative to existing fire protection requirements. On February 9, 2001, the NFPA Standards Council approved the 2001 Edition of NFPA 805 as an American National Standard for performance-based fire protection for light-water nuclear power plants.

A licensee that elects to adopt NFPA 805 must meet the performance goals, objectives, and criteria that are itemized in Chapter 1 of NFPA 805 through the implementation of PB or deterministic approaches. The goals include ensuring that reactivity control, inventory and pressure control, decay heat removal, vital auxiliaries, and process monitoring are achieved and maintained. The licensee then must establish plant fire protection requirements using the methodology in Chapter 2 of NFPA 805 such that the minimum FPP elements and design criteria contained in Chapter 3 of NFPA 805 are satisfied. Next, the licensee identifies fire areas and fire hazards through a plant-wide analysis, and then applies either a PB or a deterministic approach to meet the performance criteria. As part of a PB approach, the licensee will use engineering evaluations, probabilistic safety assessments (PSAs), and fire modeling (FM) calculations to show that the criteria are met. Chapter 4 of NFPA 805 establishes the methodology to determine the fire protection systems and features required to achieve the performance criteria. It also specifies that at least one success path to achieve the nuclear safety performance criteria (NSPC) shall be maintained free of fire damage by a single fire.

RG 1.205 also states:

> Effective July 16, 2004, the Commission amended its fire protection requirements in 10 CFR 50.48 to add 10 CFR 50.48(c), which incorporates by reference the 2001 Edition of NFPA 805, with certain exceptions, and allows licensees to apply for a license amendment to comply with the 2001 Edition of NFPA 805

> (69 FR 33536). NFPA has issued subsequent editions of NFPA 805, but the regulation does not endorse them.

Throughout this SE, where the NRC staff states that the licensee's FPP element is in compliance with (or meets the requirements of) NFPA 805, the NRC staff is referring to NFPA 805 with the exceptions, modifications, and supplementation described in 10 CFR 50.48(c)(2).

RG 1.205 also states, in part:

> In parallel with the Commission's efforts to issue a rule incorporating the risk-informed, performance-based fire protection provisions of NFPA 805, NEI [Nuclear Energy Institute] published implementing guidance for the specific provisions of NFPA 805 and 10 CFR 50.48(c) in NEI 04-02 ["Guidance for Implementing a Risk-Informed, Performance-Based Fire Protection Program Under 10 CFR 50.48(c)," Revision 2 (Reference 7)].

RG 1.205 provides the NRC staff's position on NEI 04-02, Revision 2, and offers additional information and guidance to supplement the NEI document and assist licensees in meeting the NRC's regulations in 10 CFR 50.48(c) related to adopting an RI/PB FPP. RG 1.205 endorses the guidance of NEI 04-02, Revision 2, subject to certain exceptions, as providing methods acceptable to the staff for adopting an FPP consistent with the 2001 Edition of NFPA 805 and 10 CFR 50.48(c).

Accordingly, Florida Power & Light Company (FPL, the licensee) requested license amendments to allow it to establish and maintain the Turkey Point Nuclear Generating Unit Nos. 3 and 4 (Turkey Point) FPP in accordance with 10 CFR 50.48(c) and change the Renewed Facility Operating Licenses and Technical Specifications (TSs) accordingly.

1.2 Requested Licensing Action

By letter dated June 28, 2012 (Reference 8), as supplemented by letters dated September 19, 2012 (Reference 9), March 18, 2013 (Reference 10), April 16, 2013 (Reference 11), May 15, 2013 (Reference 12), January 7, 2014 (Reference 13), April 4, 2014 (Reference 14), June 6, 2014 (Reference 15), July 18, 2014 (Reference 16), September 12, 2014 (Reference 17), November 5, 2014 (Reference 18), December 2, 2014 (Reference 19), and February 18, 2015 (Reference 20), the licensee submitted an application for license amendments to transition the Turkey Point FPP from 10 CFR 50.48(b) to 10 CFR 50.48(c), NFPA 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants," 2001 Edition. The supplemental letters were in response to the NRC staff's requests for additional information (RAIs) dated September 11, 2012 (Reference 21), March 15, 2013 (Reference 22), November 7, 2013 (Reference 23), February 10, 2014 (Reference 24), May 27, 2014 (Reference 25), and July 14, 2014 (Reference 26). The licensee's supplemental letters dated January 7, April 4, June 6, July 18, September 12, November 5, and December 2, 2014; and February 18, 2015, provided additional information that clarified the application, but did not expand the overall scope of the application as originally noticed, and did not change the NRC staff's original proposed no significant hazards consideration determination as published in the FR on February 4, 2014 (79 FR 6648).

The licensee requested amendments to the Turkey Point renewed facility operating licenses and TSs in order to establish and maintain an RI/PB FPP in accordance with the requirements of 10 CFR 50.48(c).

Specifically, the licensee requested to transition from the existing deterministic fire protection licensing basis established in accordance with the Updated Final Safety Analysis Report (UFSAR) for Turkey Point Units 3 and 4 and as approved in the Safety Evaluation Report (SER) dated March 21, 1979 (Reference 27), and supplemented by NRC letters dated April 3, 1980 (Reference 28), July 9, 1980 (Reference 29), December 8, 1980 (Reference 30), January 26, 1981 (Reference 31), May 10, 1982 (Reference 32), March 27, 1984 (Reference 33), April 16, 1984 (Reference 34), August 12, 1987 (Reference 35), and by SEs dated February 25, 1994 (Reference 36), February 24, 1998 (Reference 37), October 8, 1998 (Reference 38), December 22, 1998 (Reference 39), May 4, 1999 (Reference 40), and May 5, 1999 (Reference 41), to an RI/PB FPP in accordance with 10 CFR 50.48(c) that uses risk information, in part, to demonstrate compliance with the fire protection and nuclear safety goals, objectives, and performance criteria of NFPA 805. As such, the proposed FPP at Turkey Point is referred to as RI/PB throughout this SE.

In its license amendment request (LAR), the licensee provided a description of the revised FPP for which it is requesting NRC approval to implement, a description of the FPP that it will implement under 10 CFR 50.48(a) and (c), and the results of the evaluations and analyses required by NFPA 805.

This SE documents the NRC staff's evaluation of the licensee's LAR and the NRC staff's conclusion that:

1. The licensee has identified any orders, license conditions, and the TSs that must be revised or superseded, and that any necessary revisions are adequate, as required by 10 CFR 50.48(c)(3)(i);

2. The licensee has completed its implementation of the methodology in Chapter 2, "Methodology," of NFPA 805 (including all required evaluations and analyses), and the NRC staff has approved the licensee's modified fire protection plan, which reflects the decision to comply with NFPA 805, as required by 10 CFR 50.48(a); and

3. The licensee will modify its FPP, as described in the LAR, in accordance with the implementation schedule set forth in this SE and the accompanying license condition, as required by 10 CFR 50.48(c)(3)(ii).

The licensee proposed a new fire protection license condition reflecting the new RI/PB FPP licensing basis, as well as revisions to the TSs that address this change to the current FPP basis. SE Sections 2.4.2 and 4.0 discuss in detail the license condition, and SE Section 2.4.3 discusses the TS changes.

2.0 REGULATORY EVALUATION

Section 50.48, "Fire protection," of 10 CFR provides the NRC requirements for NPP fire protection. Section 50.48 includes specific requirements for requesting approval for an RI/PB FPP based on the provisions of NFPA 805 (Reference 3). Paragraph 50.48(c)(3)(i) of 10 CFR states, in part:

> A licensee may maintain a fire protection program that complies with NFPA 805 as an alternative to complying with paragraph (b) of this section [10 CFR 50.48(b)] for plants licensed to operate before January 1, 1979, or the fire protection license conditions for plants licensed to operate after January 1, 1979. The licensee shall submit a request to comply with NFPA 805 in the form of an application for license amendment under [10 CFR] 50.90. The application must identify any orders and license conditions that must be revised or superseded, and contain any necessary revisions to the plant's technical specifications and the bases thereof.

In addition, 10 CFR 50.48(c)(3)(ii) states:

> The licensee shall complete its implementation of the methodology in Chapter 2 of NFPA 805 (including all required evaluations and analyses) and, upon completion, modify the fire protection plan required by paragraph (a) of this section to reflect the licensee's decision to comply with NFPA 805, before changing its fire protection program or nuclear power plant as permitted by NFPA 805.

The intent of 10 CFR 50.48(c)(3)(ii) is given in the statement of considerations for the Final Rule, "Voluntary Fire Protection Requirements for Light Water Reactors; Adoption of NFPA 805 as a Risk-Informed, Performance-Based Alternative," as published in the FR on June 16, 2004 (69 FR 33536, 33548). The statement of considerations states, in part:

> This paragraph requires licensees to complete all of the Chapter 2 methodology (including evaluations and analyses) and to modify their fire protection plan before making changes to the fire protection program or to the plant configuration. This process ensures that the transition to an NFPA 805 configuration is conducted in a complete, controlled, integrated, and organized manner. This requirement also precludes licensees from implementing NFPA 805 on a partial or selective basis (e.g., in some fire areas and not others, or truncating the methodology within a given fire area).

As stated in 10 CFR 50.48(c)(3)(i), the Director of the Office of Nuclear Reactor Regulation (NRR), or a designee of the Director, may approve the application if the director or designee determines that the licensee has identified orders, license conditions, and the TSs that must be revised or superseded, and that any necessary revisions are adequate.

The regulations also allow for flexibility that was not included in the NFPA 805 standard. Licensees who choose to adopt 10 CFR 50.48(c) but wish to use the PB methods permitted elsewhere in the standard to meet the fire protection requirements of NFPA 805, Chapter 3,

"Fundamental Fire Protection Program and Design Elements," must submit an LAR in accordance with 10 CFR 50.48(c)(2)(vii). This regulation further provides that:

> The Director of the Office of Nuclear Reactor Regulation, or a designee of the Director, may approve the application if the Director or designee determines that the performance-based approach;
>
> (A) Satisfies the performance goals, performance objectives, and performance criteria specified in NFPA 805 related to nuclear safety and radiological release;
>
> (B) Maintains safety margins; and
>
> (C) Maintains fire protection defense-in-depth (DID) (fire prevention, fire detection, fire suppression, mitigation, and post-fire safe shutdown (SSD) capability).

Alternatively, licensees may choose to use RI or PB alternatives to comply with NFPA 805 by submitting an LAR in accordance with 10 CFR 50.48(c)(4), which states:

> The Director of the Office of Nuclear Reactor Regulation, or designee of the Director, may approve the application if the Director or designee determines that the proposed alternatives:
>
> (i) Satisfy the performance goals, performance objectives, and performance criteria specified in NFPA 805 related to nuclear safety and radiological release;
>
> (ii) Maintain safety margins; and
>
> (iii) Maintain fire protection DID (fire prevention, fire detection, fire suppression, mitigation, and post-fire safe shutdown capability).

In addition to the conditions outlined by the rule that require licensees to submit an LAR for NRC review and approval in order to adopt an RI/PB FPP, a licensee may also submit additional elements of its FPP for which it wishes to receive specific NRC review and approval, as set forth in Regulatory Position C.2.2.1 of RG 1.205 (Reference 4). Inclusion of these elements in the NFPA 805 LAR is meant to alleviate uncertainty in portions of the current FPP licensing bases as a result of the lack of specific NRC approval of these elements. RGs are not substitutes for regulations and compliance with them is not required. Methods and solutions that differ from those set forth in RGs will be deemed acceptable if they provide a basis for the findings required for the issuance or continuance of a permit or license by the Commission. Accordingly, any submittal addressing these additional FPP elements needs to include sufficient detail to allow the NRC staff to assess whether the licensee's treatment of these elements meets 10 CFR 50.48(c) requirements.

The purpose of the FPP established by NFPA 805 is to provide assurance, through a DID philosophy that the NRC's fire protection objectives are satisfied. NFPA 805, Section 1.2, "Defense-in-Depth," states:

> Protecting the safety of the public, the environment, and plant personnel from a plant fire and its potential effect on safe reactor operations is paramount to this standard. The fire protection standard shall be based on the concept of defense-in-depth. Defense-in-depth shall be achieved when an adequate balance of each of the following elements is provided:
>
> (1) Preventing fires from starting;
>
> (2) Rapidly detecting fires and controlling and extinguishing promptly those fires that do occur, thereby limiting fire damage; and
>
> (3) Providing an adequate level of fire protection for SSCs important to safety, so that a fire that is not promptly extinguished will not prevent essential plant safety functions from being performed.

2.1 Other Applicable Regulations

The following regulations address fire protection:

- GDC 3, "Fire protection," to 10 CFR Part 50, Appendix A, states:

  > Structures, systems, and components important to safety shall be designed and located to minimize, consistent with other safety requirements, the probability and effect of fires and explosions. Noncombustible and heat resistant materials shall be used wherever practical throughout the unit, particularly in locations such as the containment and control room. Fire detection and fighting systems of appropriate capacity and capability shall be provided and designed to minimize the adverse effects of fires on structures, systems, and components important to safety. Firefighting systems shall be designed to assure that their rupture or inadvertent operation does not significantly impair the safety capability of these structures, systems, and components.

- GDC 5, "Sharing of structures, systems, and components," to 10 CFR Part 50, Appendix A, states:

  > Structures, systems, and components important to safety shall not be shared among nuclear power units unless it can be shown that such sharing will not significantly impair their ability to perform their safety functions, including, in the event of an accident in one unit, an orderly shutdown and cooldown of the remaining units.

- 10 CFR 50.48(a)(1) requires that each holder of an operating license have a fire protection plan that satisfies GDC 3 of Appendix A to 10 CFR Part 50.

- 10 CFR 50.48(c) incorporates NFPA 805 (2001 Edition) (Reference 3) by reference, with certain exceptions, modifications and supplementation. This regulation establishes the requirements for using an RI/PB FPP in conformance with NFPA 805 as a voluntary alternative to the requirements in 10 CFR 50.48(b) and Appendix R, "Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979," to 10 CFR Part 50, or the specific plant fire protection license condition.

- 10 CFR Part 20, "Standards for protection against radiation," establishes the radiation protection limits used as NFPA 805 radioactive release performance criteria, as specified in NFPA 805, Section 1.5.2, "Radioactive Release Performance Criteria."

2.2 Applicable Guidance

The NRC staff review also relied on the following additional codes, RGs, and standards:

- RG 1.205, Revision 1, issued December 2009 (Reference 4), which provides guidance for use in complying with the requirements that the NRC has promulgated for RI/PB FPPs that comply with 10 CFR 50.48 and the referenced 2001 Edition of the NFPA standard. It endorses portions of NEI 04-02, Revision 2 (Reference 7), where it has been found to provide methods acceptable to the NRC for implementing NFPA 805 and complying with 10 CFR 50.48(c). The regulatory positions in Section C of RG 1.205 include clarification of the guidance provided in NEI 04-02, as well as NRC exceptions to the guidance. RG 1.205 sets forth regulatory positions, emphasizes certain issues, clarifies the requirements of 10 CFR 50.48(c) and NFPA 805, clarifies the guidance in NEI 04-02, and modifies the NEI 04-02 guidance where required. Should a conflict occur between NEI 04-02 and this RG, the regulatory positions in RG 1.205 govern. This RG also indicates that Chapter 3 of NEI 00-01, "Guidance for Post-Fire Safe Shutdown Circuit Analysis," Revision 2, issued May 2009, when used in conjunction with NFPA 805 and the RG, provides one acceptable approach to circuit analysis for a plant implementing an FPP under 10 CFR 50.48(c).

- The 2001 Edition of NFPA 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants" (Reference 3), which specifies the minimum fire protection requirements for existing light water NPPs during all phases of plant operations, including shutdown, degraded conditions, and decommissioning. NFPA 805 was developed to provide a comprehensive RI/PB standard for fire protection. The NFPA 805 Technical Committee on Nuclear Facilities is composed of nuclear plant licensees, the NRC, insurers, equipment manufacturers, and subject matter experts. The standard was developed in accordance with NFPA processes, and consisted of a number of technical meetings and reviews of draft documents by committee and industry representatives. The scope of NFPA 805 includes goals related to nuclear safety, radioactive release, life safety, and plant damage/business interruption. The standard addresses fire protection requirements for nuclear plants during all plant operating modes and conditions, including shutdown and decommissioning, which had not been

explicitly addressed by previous requirements and guidelines. NFPA 805 became effective on February 9, 2001.

- NEI 04-02, "Guidance for Implementing a Risk-Informed, Performance-Based Fire Protection Program Under 10 CFR 50.48(c)" (Reference 7), which provides guidance for implementing the requirements of 10 CFR 50.48(c), and represents methods for implementing in whole or in part an RI/PB FPP. This implementing guidance for NFPA 805 has two primary purposes: (1) provide direction and clarification for adopting NFPA 805 as an acceptable approach to fire protection, consistent with 10 CFR 50.48(c); and (2) provide additional supplemental technical guidance and methods for using NFPA 805 and its appendices to demonstrate compliance with fire protection requirements. Although there is a significant amount of detail in NFPA 805 and its appendices, clarification and additional guidance for select issues help ensure consistency and effective utilization of the standard. The NEI 04-02 guidance focuses attention on the RI/PB fire protection goals, objectives, and performance criteria contained in NFPA 805 and the RI/PB tools considered acceptable for demonstrating compliance. Revision 2 of NEI 04-02 incorporates guidance from RG 1.205 and approved Frequently Asked Questions (FAQs).

- NEI 00-01, "Guidance for Post Fire Safe Shutdown Circuit Analysis," Revision 2 (Reference 42), provides a deterministic methodology for performing post-fire safe shutdown analysis (SSA). In addition, NEI 00-01 includes information on RI methods (when allowed within a plant's licensing basis) that may be used in conjunction with the deterministic methods for resolving circuit failure issues related to multiple spurious operations (MSO). The RI method is intended for application by licensees to determine the risk significance of identified circuit failure issues related to MSO. RG 1.205 indicates that Chapter 3 of NEI 00-01, Revision 2, when used in conjunction with NFPA 805 and RG 1.205, provides one acceptable approach to circuit analysis for a plant implementing an FPP under 10 CFR 50.48(c).

- RG 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," Revision 2, issued May 2011 (Reference 43), which provides the NRC staff's recommendations for using risk information in support of licensee-initiated licensing basis changes to a NPP that require such review and approval. The guidance provided does not preclude other approaches for requesting licensing basis changes. Rather, RG 1.174 is intended to improve consistency in regulatory decisions in areas in which the results of risk analyses are used to help justify regulatory action. As such, the RG provides general guidance concerning one approach that the NRC has determined to be acceptable for analyzing issues associated with proposed changes to a plant's licensing basis and for assessing the impact of such proposed changes on the risk associated with plant design and operation.

- RG 1.200, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," Revision 2, issued March 2009 (Reference 44), which provides guidance to licensees for use in determining the technical adequacy of the base probabilistic risk assessment (PRA) used in an RI

regulatory activity, and endorses standards and industry peer review guidance. The RG provides guidance in four areas:

1. A definition of a technically acceptable PRA;

2. The NRC's position on PRA consensus standards and industry PRA peer review program documents;

3. Demonstration that the baseline PRA (in total or specific pieces) used in regulatory applications is of sufficient technical adequacy; and

4. Documentation to support a regulatory submittal.

It does not provide guidance on how the base PRA is revised for a specific application or how the PRA results are used in application-specific decision-making processes.

- American Society of Mechanical Engineers (ASME)/American Nuclear Society (ANS) RA-Sa-2009, "Addenda to ASME/ANS RA-S-2008, Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications" (Reference 45), which provides guidance PRAs used to support RI decisions for commercial light water reactor NPPs and prescribes a method for applying these requirements for specific applications. The standard gives guidance for a Level 1 PRA of internal and external hazards for all plant operating modes. In addition, the standard provides guidance for a limited Level 2 PRA sufficient to evaluate large early release frequency (LERF). The only hazards explicitly excluded from the scope are accidents resulting from purposeful human-induced security threats (e.g., sabotage). The standard applies to PRAs used to support applications of RI decision-making related to design, licensing, procurement, construction, operation, and maintenance.

- RG 1.189, "Fire Protection for Nuclear Power Plants," Revision 2, issued October 2009 (Reference 46), provides guidance to licensees on the proper content and quality of engineering equivalency evaluations used to support the FPP. The NRC staff developed the RG to provide a comprehensive fire protection guidance document and to identify the scope and depth of fire protection that the staff would consider acceptable for NPPs.

- NUREG-0800, Section 9.5.1.2, "Risk-Informed, Performance-Based Fire Protection Program," Revision 0, issued December 2009 (Reference 47), provides the NRC staff with guidance for evaluating LARs that seek to implement an RI/PB FPP in accordance with 10 CFR 50.48(c).

- NUREG-0800, Section 19.1, "Determining the Technical Adequacy of Probabilistic Risk Assessment for Risk-Informed License Amendment Requests After Initial Fuel Load," Revision 3, issued September 2012 (Reference 48), provides the NRC staff with guidance for evaluating the technical adequacy of a licensee's PRA results when used to request RI changes to the licensing basis.

- NUREG-0800, Section 19.2, "Review of Risk Information Used to Support Permanent Plant-Specific Changes to the Licensing Basis: General Guidance," Revision 0, issued June 2007 (Reference 49), provides the NRC staff with guidance for evaluating the risk information used by a licensee to support permanent RI changes to the licensing basis.

- NUREG/CR-6850, "EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities," Volume 1 (Reference 50), Volume 2 (Reference 51), and Supplement 1 (Reference 52), which presents a compendium of methods, data and tools to perform a fire probabilistic risk assessment (FPRA) and develop associated insights. In order to address the need for improved methods, the NRC Office of Nuclear Regulatory Research (RES) and Electric Power Research Institute (EPRI) embarked upon a program to develop state-of-art FPRA methodology. Both RES and EPRI have provided specialists in fire risk analysis, FM, electrical engineering, human reliability analysis (HRA), and systems engineering for methods development. A formal technical issue resolution process was developed to direct the deliberative process between RES and EPRI. The process ensures that divergent technical views are fully considered, yet encourages consensus at many points during the deliberation. Significantly, the process provides that each party maintain its own point of view if consensus is not reached. Consensus was reached on all technical issues documented in NUREG/CR-6850. The methodology documented in this report reflects the current state-of-the-art in FPRA. These methods are expected to form a basis for RI analyses related to the plant FPP. Volume 1, the Executive Summary, provides general background and overview information, including both programmatic and technical and project insights and conclusions. Volume 2 provides the detailed discussion of the recommended approach, methods, data, and tools for conduct of an FPRA. Supplement 1 provides clarifications and additional information on recommended approaches, methods, and data for conduct of an FPRA.

- Memorandum from Richard P. Correia, RES, to Joseph G. Giitter, NRR, titled, "Interim Technical Guidance on Fire-Induced Circuit Failure Mode Likelihood Analysis," dated June 14, 2013 (Reference 53), notes that, based on new experimental information documented in NUREG/CR-6931, "Cable Response to Live Fire (CAROLFIRE)," issued April 2008 (Reference 54), and NUREG/CR- 7100, "Direct Current Electrical Shorting in Response to Exposure Fire (DESIREE-Fire): Test Results," issued April 2012 (Reference 55), the reduction in hot short probabilities for circuits provided with control power transformers (CPTs) identified in NUREG/CR-6850 cannot be repeated in experiments, and therefore, may be too high and should be reduced.

- NUREG-1805, "Fire Dynamics Tools (FDTs): Quantitative Fire Hazard Analysis Methods for the U.S. Nuclear Regulatory Commission Fire Protection Inspection Program" (Reference 56), which provides quantitative methods known as "Fire Dynamics Tools (FDTs)," to assist regional fire protection inspectors in performing fire hazard analysis. The FDTs are intended to assist fire protection inspectors in performing RI evaluations of credible fires that may cause critical damage to essential SSD equipment, as required by the new reactor oversight process defined in the NRC's inspection manual.

- NUREG-1824, "Verification and Validation of Selected Fire Models for Nuclear Power Plant Applications," Volumes 1 through 7 (Reference 57), which provide technical documentation regarding the predictive capabilities of a specific set of fire models for the analysis of fire hazards in NPP scenarios. This report is the result of a collaborative program with EPRI and the National Institute of Standards and Technology (NIST). The selected models are:

  1. FDTs developed by NRC (Volume 3),

  2. Fire-Induced Vulnerability Evaluation Methodology-Rev. 1 developed by EPRI (Volume 4),

  3. The zone model Consolidated Model of Fire and Smoke Transport (CFAST) developed by NIST (Volume 5),

  4. The zone model MAGIC developed by Électricité de France (Volume 6), and

  5. The computational fluid dynamics model fire dynamics simulator developed by NIST (Volume 7).

  In addition to the fire model volumes, Volume 1 is the comprehensive main report and Volume 2 is a description of the experiments and associated experimental uncertainty used in developing this report.

- NUREG/CR-7010, "Cable Heat Release, Ignition, and Spread in Tray Installations during Fire (CHRISTIFIRE), Phase 1: Horizontal Trays," Volume 1 (Reference 58), describes Phase 1 of the CHRISTIFIRE testing program conducted by NIST. The overall goal of this multiyear program is to quantify the burning characteristics of grouped electrical cables installed in cable trays. This first phase of the program focuses on horizontal tray configurations. CHRISTIFIRE addresses the burning behavior of a cable in a fire beyond the point of electrical failure. The data obtained from this project can be used for the development of fire models to calculate the heat release rate (HRR) and flame spread of a cable fire.

- NUREG-1855, Volume 1, "Guidance on the Treatment of Uncertainties Associated with PRAs in Risk-Informed Decision Making" (Reference 59), provides guidance on how to treat uncertainties associated with PRA in RI decision-making. The objectives of this guidance include fostering an understanding of the uncertainties associated with PRA and their impact on the results of PRA and providing a pragmatic approach to addressing these uncertainties in the context of the decision-making. To meet the objective of the NUREG, it is necessary to understand the role that PRA results play in the context of the decision process. To define this context, NUREG-1855 provides an overview of the RI decision-making process itself.

- NUREG-1921, "EPRI/NRC-RES Fire Human Reliability Analysis Guidelines - Final Report" (Reference 60), which presents the state of the art in fire HRA practice. This report was developed jointly between RES and EPRI to develop the methodology and

supporting guidelines for estimating human error probabilities (HEPs) for human failure events (HFEs) following the fire-induced initiating events of an FPRA. The report builds on existing HRA methods, and is intended primarily for practitioners conducting a fire HRA to support an FPRA.

- NUREG-1934, "Nuclear Power Plant Fire Modeling Analysis Guidelines (NPP FIRE MAG)" (Reference 61), describes the implications of the verification and validation (V&V) results from NUREG-1824 for fire model users. The features and limitations of the fire models documented in NUREG-1824 are discussed relative to their use to support NPP fire hazard analyses. The report also provides information to assist fire model users in applying this technology in the NPP environment.

- Generic Letter (GL) 2006-03, "Potentially Nonconforming Hemyc and MT Fire Barrier Configurations" (Reference 62), which requested that licensees evaluate their facilities to confirm compliance with the existing applicable regulatory requirements in light of the information provided in this GL and, if appropriate, take additional actions.

- NFPA 101, "Life Safety Code" (Reference 63), provides the minimum requirements for egress; features of fire protection, sprinkler systems, alarms, emergency lighting, smoke barriers; and special hazard protection.

- NFPA 30, "Flammable and Combustible Liquids Code" (Reference 64), provides requirements for the safe storage, handling, and use of flammable and combustible liquids.

- NFPA 51B, "Standard for Fire Prevention During Welding, Cutting, and Other Hot Work" (Reference 65), provides requirements for preventing injury, loss of life, and loss of property from fire or explosion as a result of hot work projects such as welding, heat treating, grinding, and similar applications producing or using sparks, flames, or heat.

- NFPA 72, "National Fire Alarm and Signaling Code" (Reference 66), provides requirements for the application, installation, location, performance, inspection, testing, and maintenance of fire alarm systems, supervising station alarm systems, public emergency alarm reporting systems, fire warning equipment and emergency communications systems, and their components.

- NFPA 76, "Standard for the Fire Protection of Telecommunications Facilities" (Reference 67), provides requirements for fire protection of telecommunications facilities providing telephone, data, internet transmission, wireless, and video services as well as life safety for the occupants plus protection of equipment and service continuity.

- NFPA 241, "Standard for Safeguarding Construction, Alteration, and Demolition Operations" (Reference 68), provides requirements for preventing or minimizing fire damage to structures, including those in underground locations, during construction, alteration, or demolition.

- NFPA 262, "Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces" (Reference 69), provides a test procedure to evaluate the potential for smoke and fire spread along cables and wires housed in a plenum or other air transport spaces.

2.3 NFPA 805 Frequently Asked Questions

In the LAR, the licensee proposed to use a number of documents commonly known as NFPA 805 FAQs. The following table provides the set of FAQs the licensee used that the NRC staff referenced in the preparation of this SE, as well as the SE sections to which each FAQ is referenced.

Table 2.3-1: NFPA 805 Frequently Asked Questions

FAQ #	FAQ Title and Summary	Reference	SE Section
06-0022	"Electrical Cable Flame Propagation Tests" • This FAQ provides a list of acceptable electrical cable flame propagation tests.	(Reference 70)	3.1.4.2
07-0030	"Establishing Recovery Actions" • This FAQ provides an acceptable process for determining the recovery actions (RAs) for NFPA 805, Chapter 4 compliance. The process includes: ▪ Differentiation between RAs and activities in the main control room (MCR) or at primary control station(s) (PCS). ▪ Determination of which RAs are required by the NFPA 805 FPP. ▪ Evaluate the additional risk presented by the use of RAs. ▪ Evaluate the feasibility of the identified RAs. ▪ Evaluate the reliability of the identified RAs.	(Reference 71)	3.2.5 3.4.4 3.5.1.7
07-0038	"Lessons Learned on Multiple Spurious Operations (MSOs)" • This FAQ reflects an acceptable process for the treatment of MSOs during transition to NFPA 805: ▪ Step 1 – Identify potential MSO combinations of concern. ▪ Step 2 – Expert panel assesses plant-specific vulnerabilities and reviews MSOs of concern. ▪ Step 3 – Update the FPRA and Nuclear Safety Capability Assessment (NSCA) to include MSOs of concern. ▪ Step 4 – Evaluate for NFPA 805 compliance. ▪ Step 5 – Document the results.	(Reference 72)	3.2.4 3.2.7
07-0039	"Incorporation of Pilot Plant Lessons Learned – Table B-2" • This FAQ provides additional detail for the comparison of the licensee's safe shutdown strategy to the endorsed industry guidance, NEI 00-01 "Guidance for Post-Fire Safe Shutdown Circuit Analysis," Revision 1 (Reference 73). In short, the process has the licensees: ▪ Assemble industry and plant-specific documentation; ▪ Determine which sections of the guidance are applicable; ▪ Compare the existing safe shutdown methodology to the applicable guidance; and ▪ Document any discrepancies.	(Reference 74)	3.2.1

FAQ #	FAQ Title and Summary	Reference	SE Section
07-0040	"Non-Power Operations (NPOs) Clarifications" • This FAQ clarifies an acceptable NFPA 805 NPO program. The process includes: ▪ Selecting NPOs equipment and cabling. ▪ Evaluation of NPOs Higher Risk Evolutions (HRE). ▪ Analyzing NPO Key Safety Functions (KSFs). ▪ Identifying plant areas to protect or "pinch points" during NPOs HREs and actions to be taken if KSFs are lost.	(Reference 75)	3.5.3
08-0042	"Fire Propagation From Electrical Cabinets" • This FAQ provides clarification of guidance regarding fire propagation from electrical cabinets, in particular the screening of electrical cabinets where the fire will not propagate.	(Reference 76)	3.4.2.2
08-0043	"Electrical Cabinet Fire Location" • This FAQ provides clarification regarding the location of fires within electrical cabinets in FM calculations.	(Reference 77)	3.4.2.3.2
08-0046	"Incipient Fire Detection Systems" • This FAQ provides guidance for modeling non-suppression probability when an incipient fire detection system is installed in electrical cabinets outside the MCR.	(Reference 78)	3.2.6.1
08-0052	"Transient Fires - Growth Rates and Control Room Non-Suppression" • This FAQ clarifies and updates the treatment of transient fires in terms of both manual suppression and time-dependent fire growth modeling.	(Reference 79)	3.4.2.3.2
08-0054	"Compliance with Chapter 4 of NFPA 805" • This FAQ provides an acceptable process to demonstrate Chapter 4 compliance for transition: ▪ Step 1 – Assemble documentation ▪ Step 2 – Document Fulfillment of NSPC ▪ Step 3 – Variance From Deterministic Requirements (VFDR) Identification, Characterization, and Resolution Considerations ▪ Step 4 – Performance-Based Evaluations ▪ Step 5 – Final VFDR Evaluation ▪ Step 6 – Document Required Fire Protection Systems and Features	(Reference 80)	3.4.2.2 3.4.3 3.5.1.4

FAQ #	FAQ Title and Summary	Reference	SE Section
10-0059	"Monitoring Program" • This FAQ provides clarification regarding the implementation of an NFPA 805 monitoring program for transition. It includes: ▪ Monitoring program analysis units; ▪ Screening of low safety significant SSCs; ▪ Action level thresholds; and ▪ The use of existing monitoring programs.	(Reference 81)	3.7.1

2.4 Orders, License Conditions and Technical Specifications

Paragraph 50.48(c)(3)(i) of 10 CFR states, in part, that the LAR, "... must identify any orders and license conditions that must be revised or superseded, and contain any necessary revisions to the plant's TSs and the bases thereof."

2.4.1 Orders

The NRC staff reviewed LAR Section 5.2.3, "Orders and Exemptions," and LAR Attachment O, "Orders and Exemptions," with regard to NRC-issued orders pertinent to Turkey Point that are being revised or superseded by the NFPA 805 transition process. The LAR stated that the licensee conducted a review of its docketed correspondence to determine if there were any orders or exemptions that needed to be superseded or revised. The LAR also stated that the licensee conducted a review to ensure that compliance with the physical protection requirements, security orders, and adherence to those commitments applicable to Turkey Point are maintained. The licensee discussed the affected orders and exemptions in LAR Attachment O.

The licensee requested that 22 exemptions be rescinded and that the engineering evaluations for 3 of the 22 exemptions be transitioned to NFPA 805. The licensee also determined that no orders need to be superseded or revised to implement an FPP that complies with 10 CFR 50.48(c).

This review, conducted by the licensee included an assessment of docketed correspondence files and electronic searches, including the NRC's Agencywide Documents Access and Management System (ADAMS). The review was performed to ensure that compliance with the physical protection requirements, security orders, and adherence to commitments applicable to Turkey Point are maintained. The NRC staff accepts the licensee's determination that 22 exemptions should be rescinded and that the engineering evaluations for 3 of the 22 exemptions are being transitioned to NFPA 805 as listed in LAR Attachment K, "Existing Licensing Action Transition," and that no orders need to be superseded or revised to implement NFPA 805 at Turkey Point. (See SE Section 2.5 for the NRC staff's detailed evaluation of the exemptions being rescinded.)

The licensee also performed a specific review of the license amendments that incorporated the mitigation strategies required by 10 CFR 50.54(hh)(2) to ensure that any changes being made in order to comply with 10 CFR 50.48(c) do not invalidate existing commitments applicable to Turkey Point. The licensee's review of this regulation and the related license amendments

demonstrated that changes to the FPP during transition to NFPA 805 will not affect the mitigation measures required by 10 CFR 50.54(hh)(2). The licensee will continue to have strategies that address large fires and explosions including a firefighting response strategy, operations to mitigate fuel damage, and actions to minimize release upon transition to NFPA 805. The NRC staff concludes that the licensee's determination in regard to 10 CFR 50.54(hh)(2) is acceptable.

2.4.2 License Conditions

The NRC staff reviewed LAR Section 5.2.1, "License Condition Changes," and LAR Attachment M, "License Condition Changes," as supplemented, regarding changes the licensee seeks to make to the Turkey Point fire protection license conditions in order to adopt NFPA 805, as required by 10 CFR 50.48(c)(3).

The NRC staff reviewed the revised license conditions, which supersede the current Turkey Point fire protection license conditions, for consistency with the format and content guidance described in Regulatory Position C.3.1 of RG 1.205, Revision 1, and with the proposed plant modifications identified in the LAR.

The revised license conditions provide a structure and detailed criteria to allow self-approval for RI/PB as well as other types of changes to the FPP. The structure and detailed criteria result in a process that meets the requirements in NFPA 805, Sections 2.4, "Engineering Analyses"; 2.4.3, "Fire Risk Evaluations"; and 2.4.4, "Plant Change Evaluation of NFPA 805." These sections establish the requirements for the content and quality of the engineering evaluations to be used for approval of changes.

The revised license conditions also define the limitations imposed on the licensee during the transition phase of plant operations when the physical plant configuration does not fully match the configuration represented in the fire risk analysis. The limitations on self-approval are required because NFPA 805 requires that the risk analyses be based on the as-built, as-operated and maintained plant, and reflect the operating experience at the plant. Until the proposed implementation items and plant modifications are completed, the risk analysis is not based on the as-built, as-operated and maintained plant.

Overall, the licensee's proposed revised license conditions would provide structure and detailed criteria to allow self-approval for FPP changes that meet the requirements of NFPA 805 with regard to engineering analyses, fire risk evaluations (FREs) and plant change evaluations (PCEs). The NRC staff's evaluation of the self-approval process for FPP changes (post-transition) is contained in SE Section 2.6. The license conditions also reference the plant-specific modifications and associated implementation schedules that must be accomplished at Turkey Point to complete transition to NFPA 805 and comply with 10 CFR 50.48(c). The license conditions also include a requirement that appropriate compensatory measures will remain in place until implementation of the specified plant modifications is completed. These modifications and implementation schedules are identical to those identified elsewhere in the LAR, as discussed in SE Section 2.7.

SE Section 4.0 provides the NRC staff's review of the proposed Turkey Point FPP license conditions.

2.4.3 Technical Specifications

The NRC staff reviewed LAR Section 5.2.2, "Technical Specifications," and LAR Attachment N, "Technical Specification Changes," as supplemented, with regard to proposed changes to the Turkey Point TSs that are being revised or superseded during the NFPA 805 transition process. According to the LAR, the licensee conducted a review of the Turkey Point TSs to determine which, if any, TS sections will be impacted by the transition to an RI/PB FPP based on 10 CFR 50.48(c). The NRC staff found that the licensee had previously requested, and obtained NRC approval for, removal of fire protection requirements from the Turkey Point TSs in Amendments 159 and 153 (Reference 36). Although the licensee previously removed fire protection requirements from the Turkey Point TSs, the licensee identified one change to the TSs that involved deleting TS 6.8.1, which requires that written procedures be established, implemented, and maintained for FPP implementation. The licensee stated that the change to the TSs is adequate for adoption of the new fire protection licensing basis because the requirement for establishing, implementing, and maintaining fire protection procedures is now contained in the regulations (10 CFR 50.48(a); 10 CFR 50.48(c); and NFPA 805, Chapter 3).

The NRC staff concludes that the proposed deletion is acceptable because the TS being changed is an administrative control, and it would be redundant to the NFPA 805 requirement to establish FPP procedures. Failure by the licensee to establish FPP procedures would result in non-compliance with 10 CFR 50.48(c)(1), which is part of the licensee's fire protection licensing basis. Changes to fire protection administrative controls are controlled by the proposed fire protection license condition (see SE Section 4.0).

2.4.4 Updated Final Safety Analysis Report

The NRC staff reviewed the LAR and found that LAR Figure 4-9 indicates that a revised UFSAR will be developed as a post-transition document representing the revised license conditions. The licensee further stated that after the approval of the LAR, in accordance with 10 CFR 50.71(e), the Turkey Point UFSAR will be revised and that the format and content will be consistent with FAQ 12-0062. The NRC staff concludes that the licensee's method to update the UFSAR is acceptable because the licensee updates its UFSAR in accordance with 10 CFR 50.71(e) and has stated that the format and content of the update will be consistent with the guidance provided in FAQ 12-0062.

2.5 Rescission of Exemptions

Since Turkey Point Unit 3 was licensed to operate on July 19, 1972, and Turkey Point Unit 4 was licensed to operate on April 10, 1973, the Turkey Point FPP is based on compliance with 10 CFR 50.48, Parts (a) and (b) (Appendix R), and the Turkey Point fire protection license conditions.

The NRC staff reviewed LAR Section 5.2.3, "Orders and Exemptions," LAR Attachment O, "Orders and Exemptions," and LAR Attachment K, "Existing Licensing Action Transition," with regard to previously-approved exemptions to Appendix R to 10 CFR Part 50, which the transition to an FPP licensing basis in conformance with NFPA 805 will supersede. These exemptions will no longer be required because upon approval of the RI/PB FPP in accordance with NFPA 805, Appendix R, will not be part of the licensing basis for Turkey Point.

The licensee previously requested and received NRC approval for 22 exemptions from 10 CFR Part 50 Appendix R. These exemptions were discussed in detail in LAR Attachment K. The licensee requested that the exemptions be rescinded and that the underlying engineering evaluations for 3 of the 22 exemptions be transitioned to the new licensing basis under 10 CFR 50.48(a) and 50.48(c) as previously approved (NFPA 805, Section 2.2.7) and compliant with the new regulation.

Disposition of Appendix R exemptions may follow two different paths during transition to NFPA 805:

- The exemption was found to be unnecessary because the underlying condition has been evaluated using RI/PB methods FM and/or FRE and found to be acceptable, and no further actions are necessary by the licensee.

- The exemption was found to be appropriate as a qualitative engineering evaluation that meets the deterministic requirements of NFPA 805 and is carried forward as part of the engineering analyses supporting NFPA 805 transition.

The following exemptions are rescinded as requested by the LAR and the underlying condition has been evaluated using RI/PB methods and found to be acceptable with no further actions because the philosophy of DID and sufficient safety margins are maintained (with the exception of LA-06-19840327 which is being rescinded because there is no corresponding requirement under NFPA 805) (numbering scheme provided by the licensee):

- LA-01-19840327, Exemption from the Appendix R, Section III.G.3 requirement for suppression in the control room.

- LA-03-19840327, Exemption from the Appendix R, Section III.G.2.a requirement for providing 3-hour rated fire barriers between Fire Zones 11, 12, 13, 14, 15, and 16.

- LA-04-19840327, Exemption from the Appendix R, Section III.G.2.a requirement for providing a 3-hour rated fire door for the charging pump rooms on the west walls of Fire Areas N and O.

- LA-05-19840327, Exemption from the Appendix R, Section III.G.2.c requirement for providing a fire suppression system for the charging pump rooms in Fire Areas N and O.

- LA-06-19840327, Exemption from the Appendix R, Section III.J requirement for providing emergency lighting units in Units 3 and 4 containment.

- LA-08-19840327, Exemption from the Appendix R, Section III.G.2.c requirement for providing the enclosure of one charging pump in a 1-hour barrier for Fire Areas N and O.

- LA-09-19840327, Exemption from the Appendix R, Section III.G.2.a requirement for total enclosure of one diesel generator radiator room by a 3-hour rated fire barrier.

- LA-11-19870812, Exemption from the Appendix R, Section III.G.2.b requirement for automatic detection and suppression systems in outdoor Fire Areas 76, 77, 78, 83, 87, and 90, which are separated by a horizontal distance of 20 feet or greater.

- LA-12-19870812, 10 CFR 50, Exemption from the Appendix R, Section III.G.2.c requirement for providing automatic detection and suppression in outdoor Fire Zones 76, 77, 78, 83, 87, and 90, which are enclosed in a fire barrier having a 1-hour rating.

- LA-13-19870812, Exemption from the Appendix R, Section III.G.2.a requirement for the separation of cables and equipment and associated non-safety circuits of redundant trains by a fire barrier having a 3-hour rating, between Fire Areas AAA and A.

- LA-14-19870812, Exemption from the Appendix R, Section III.G.2.a requirement for separation of cables and equipment and associated non-safety circuits or redundant trains by a fire barrier having a 3-hour rating between Fire Areas F and A.

- LA-15-19980224, Exemption from the Appendix R, Section III.G.2.a requirement for a 25-minute rated fire barrier until a horizontal distance of 10 feet is attained in roof-top locations excluding the turbine building.

- LA-16-19980224, Exemption from the Appendix R, Section III.G.2.a requirement for providing 3-hour electrical raceway fire barriers in the outdoor Fire Zones 47, 54, 113, 114, 115, 116, 119, and 120, excluding the turbine building.

- LA-17-19981008, Exemption from the Appendix R, Section III.G.2.a requirement for providing a 25-minute rated fire barrier until a horizontal distance of 20 feet is attained in the outdoor Fire Zones 79-partial, 84-partial, 86, 88-partial, and 89-partial, excluding the turbine bldg.

- LA-18-19981008, Exemption from the Appendix R, Section III.G.2.a requirement for providing protection in the west of the open turbine building structure column line A, by a 1-hour rated fire barrier until a horizontal distance of 20 feet is attained in Fire Zones 81 and 86.

- LA-19-19990504, Exemption from the Appendix R, Section III.G.2.a requirement for not protecting a redundant train without a 3-hour rated barrier for outdoor Fire Zone 106R to the extent that it had not protected a redundant train with a 3-hour rated barrier.

- LA-20-19990505, Exemption from the Appendix R, Section III.G.2.a requirement for separation of raceway fire barriers in the open turbine building by a minimum 1-hour rated barrier between column lines A and E-1.

- LA-21-19990505, Exemption from the Appendix R, Section III.G.2.a requirement for separation of raceway fire barriers in the open turbine building by a 25-minute fire rated barrier between column lines E-1 and Jc and the turbine deck.

- LA-22-20060927, Exemption from the Appendix R, Section III.G.3 requirement for suppression in the mechanical equipment room (Fire Zone 097) and for detection and suppression in the control room roof (Fire Zone 106R).

The following exemptions are rescinded, but the engineering evaluation of the underlying condition will be used as a qualitative engineering evaluation for transition to NFPA 805 (see SE Section 3.5.1.1):

- LA-02-19840327, Exemption from the Appendix R, Section III.O requirement for having an oil collection tank sized to contain the entire lube oil system inventory.

- LA-07-19840327, Exemption from the Appendix R, Section III.G.2.f requirement for providing non-combustible radiant energy shields in Fire Areas P and Q where separation is less than 20 feet.

- LA-10-19870812, Exemption from the Appendix R, Section III.G.2.d requirement for intervening combustibles inside the primary containment.

2.6 Self-Approval Process for FPP Changes (Post-Transition)

Upon completion of the implementation of the RI/PB FPP and issuance of the license condition discussed in SE Section 2.4.2, changes to the approved FPP must be evaluated by the licensee to ensure that they are acceptable.

NFPA 805, Section 2.2.9, "Plant Change Evaluation," states:

> In the event of a change to a previously approved fire protection program element, a risk-informed plant change evaluation shall be performed and the results used as described in 2.4.4 to ensure that the public risk associated with fire-induced nuclear fuel damage accidents is low and that adequate defense-in-depth and safety margins are maintained.

NFPA 805, Section 2.4.4, "Plant Change Evaluation," states, in part:

> A plant change evaluation shall be performed to ensure that a change to a previously approved fire protection program element is acceptable. The evaluation process shall consist of an integrated assessment of the acceptability of risk, defense-in-depth, and safety margins.

2.6.1 Post-Implementation Plant Change Evaluation Process

The NRC staff reviewed LAR Section 4.7.2, "Compliance with Configuration Control Requirements in Sections 2.7.2 and 2.2.9 of NFPA 805," for compliance with the NFPA 805

PCE requirements to address potential changes to the NFPA 805 RI/PB FPP after implementation is completed. The licensee will develop a change process that is based on the guidance provided in NFPA 805, Sections 2.2(h), 2.2.9, 2.4.4, A.2.2(h), A.2.4.4, and D.5; NEI 04-02 (Reference 7), Section 5.3, "Plant Change Process"; as well as Appendices B, I, and J; and RG 1.205 (Reference 4), Regulatory Positions 2.2.4, 3.1, 3.2, and 4.3.

LAR Section 4.7.2 states that the PCE process consists of four steps:

1. Defining the Change,

2. Performing the Preliminary Risk Screening,

3. Performing the Risk Evaluation, and

4. Evaluating the Acceptance Criteria.

In the LAR, the licensee stated that the PCE process begins by defining the change or altered condition in the LAR to be examined and the baseline configuration. The baseline is defined by the design basis and licensing basis. The licensee also stated that the baseline is defined as that plant condition or configuration that is consistent with the design basis and licensing basis and that the changed or altered condition or configuration that is not consistent with the design basis and licensing basis is defined as the proposed alternative.

The licensee stated that once the definition of the change is established, a screening is then performed to identify and resolve minor changes to the FPP and the screening is consistent with fire protection regulatory review processes currently in place. The licensee further stated that the screening process is modeled after NEI 02-03, "Guidance for Performing a Regulatory Review of Proposed Changes to the Approved Fire Protection Program," June 2003 (Reference 82), and that the process will address most administrative changes (e.g., changes to the combustible control program, organizational changes, etc.).

The licensee stated that once the screening process is completed, it is followed by engineering evaluations that might include FM and risk assessment techniques and the results of these evaluations are then compared to the acceptance criteria. The licensee further stated that changes that satisfy the acceptance criteria of NFPA 805, Section 2.4.4, and the fire protection license conditions (see LAR Attachment M) can be implemented within the framework provided by NFPA 805, and that the changes that do not satisfy the acceptance criteria cannot be implemented within this framework. The licensee further stated that the acceptance criteria require that the resultant change in core damage frequency (CDF) and LERF be consistent with the fire protection license conditions, and the acceptance criteria also include consideration of DID and safety margin, which would typically be qualitative in nature.

The licensee stated that the risk evaluation involves the application of FM analyses and risk assessment techniques to obtain a measure of the changes in risk associated with the proposed change and that, in certain circumstances, an initial evaluation in the development of the risk assessment may be a simplified analysis using bounding assumptions, provided the use of such assumptions does not unnecessarily challenge the acceptance criteria.

The licensee stated that the PCEs are assessed for acceptability using the ΔCDF (change in core damage frequency) and ΔLERF (change in large early release frequency) criteria from the license conditions and that the proposed changes are also assessed to ensure they are consistent with the DID philosophy and sufficient safety margins were maintained.

The licensee stated its FPP configuration is defined by the program documentation and, to the greatest extent possible, the existing configuration control processes for modifications, calculations, and analyses will be utilized to maintain configuration control of the FPP documents. The licensee further stated the configuration control procedures that govern various Turkey Point documents and databases, which currently exist, will be revised to reflect the new NFPA 805 licensing bases requirements. This action is included in Implementation Item 16, which is included in LAR Attachment S, "Plant Modifications and Items to be Completed During Implementation," Table S-3, "Implementation Items." The NRC staff concludes that this action is acceptable because it will incorporate the provisions of NFPA 805 in the FPP and would be required by the proposed license conditions.

The licensee stated that several NFPA 805 document types, such as nuclear safety capability assessment (NSCA) supporting information and non-power mode NSCA treatment, generally require new control procedures and processes to be developed because they are new documents and databases created as a result of the transition to NFPA 805. The licensee further stated the new procedures will be modeled after the existing processes for similar types of documents and databases, and system level design basis documents will be revised to reflect the NFPA 805 role that the system components now play. This action is included in Implementation Item 16, which is included in LAR Attachment S, Table S-3. The NRC staff concludes that this action is acceptable because it will incorporate the provisions of NFPA 805 in the FPP and would be required by the proposed license conditions.

The licensee stated that the process for capturing the impact of proposed changes to the plant on the FPP will continue to be a multiple step review and that the first step of the review will be an initial screening for process users to determine if there is a potential to impact the FPP as defined under NFPA 805 through a series of screening questions/checklists contained in one or more procedures, depending upon the configuration control process being used. The licensee further stated reviews that identify potential FPP impacts will be sent to qualified individuals (e.g., Fire Protection, Safe Shutdown/NSCA, FPRA, etc.) to ascertain the program impacts, if any, and that if FPP impacts are determined to exist as a result of the proposed change, the issue would be resolved by one of the following:

- Deterministic Approach: Comply with NFPA 805, Chapter 2 and Section 4.2.3 requirements; or

- PB Approach: Use the NFPA 805 change process developed in accordance with NEI 04-02, RG 1.205, and the NFPA 805 fire protection license conditions to assess the acceptability of the proposed change. This process will be used to determine if the proposed change could be implemented "as-is" or whether prior NRC approval of the proposed change is required.

The licensee stated that this process follows the requirements in NFPA 805 and the guidance outlined in RG 1.174 (Reference 43), which requires the use of qualified individuals, procedures

that require calculations and evaluations be subject to independent review and verification, record retention, peer review, and a corrective action program that ensures appropriate actions are taken when errors are discovered.

Since NFPA 805 always requires the use of a PCE regardless of what element requires the change, the NRC staff concludes that, in accordance with the requirements of NFPA 805, if FPP impacts are determined to exist as a result of the proposed change, the issue would be resolved by utilizing the NFPA 805 change process developed in accordance with NEI 04-02, RG 1.205, and the Turkey Point NFPA 805 fire protection license condition to assess the acceptability of the proposed change. This process will be used to determine if prior NRC approval of the proposed change is required.

Based on the information provided by the licensee, the NRC staff concludes that the licensee's PCE process is acceptable because it meets the guidance in NEI 04-02, Revision 2 (Reference 7), as well as RG 1.205, Revision 1 (Reference 4), and addresses attributes for using FREs in accordance with NFPA 805. NFPA 805, Section 2.4.4 requires that PCEs consist of an integrated assessment of risk, DID, and safety margins. NFPA 805, Section 2.4.3.1 requires that the PSA use CDF and LERF as measures for risk. NFPA 805, Section 2.4.3.3 requires that the risk assessment approach, methods, and data be acceptable to the authority having jurisdiction (AHJ), which is the NRC. NFPA 805, Section 2.4.3.3 also requires that the PSA be appropriate for the nature and scope of the change being evaluated, be based on the as-built and as-operated and maintained plant, and reflect the operating experience at the plant.

The licensee's PCE process includes the required delta risk calculations, uses risk assessment methods acceptable to the NRC, uses appropriate risk acceptance criteria in determining acceptability, involves the use of an FPRA of acceptable quality, and includes an integrated assessment of risk, DID, and safety margins as discussed above.

2.6.2 Requirements for the Self-Approval Process Regarding Plant Changes

Risk assessments performed to evaluate PCEs must use methods that are acceptable to the NRC staff. Acceptable methods to assess the risk of the proposed plant change may include methods that have been (1) used in developing the peer-reviewed FPRA model, (2) approved by the NRC via a plant-specific license amendment or through NRC approval of generic methods specifically for use in NFPA 805 risk assessments, or (3) demonstrated to bound the risk impact.

Based on the information provided by the licensee in the LAR, the process established to evaluate post-transition plant changes meets the guidance in NEI 04-02, Revision 2 (Reference 7), as well as RG 1.205, Revision 1 (Reference 4). The NRC staff concludes that the proposed PCE process at Turkey Point, which includes defining the change, a preliminary risk screening, a risk evaluation, and an acceptability determination as described in SE Section 2.6.1 is acceptable because it addresses the required delta risk calculations; uses risk assessment methods acceptable to the NRC; uses appropriate risk acceptance criteria in determining acceptability; involves the use of an FPRA of acceptable quality; and includes an integrated assessment of risk, DID, and safety margins.

However, before achieving full compliance with 10 CFR 50.48(c) by implementing the plant modifications discussed in SE Section 2.7.1 (i.e., during full implementation of the transition to NFPA 805), the proposed license conditions would provide that RI changes to the licensee's FPP may not be made without prior NRC review and approval, unless the changes have been demonstrated to have no more than a minimal risk impact using the screening process discussed above, because the risk analysis is not consistent with the as-built, as-operated and maintained plant since the modifications have not been completed. In addition, the conditions require the licensee to ensure that fire protection DID and safety margins are maintained during the transition process. The "Transition License Conditions" in the proposed NFPA 805 license conditions include the appropriate acceptance criteria and other attributes to form an acceptable method for meeting Regulatory Position C.3.1 of RG 1.205, Revision 1 (Reference 4) with respect to the requirements for FPP changes during transition, and therefore, demonstrate compliance with 10 CFR 50.48(c).

The proposed NFPA 805 license conditions also include a provision for self-approval of changes to the FPP that may be made on a qualitative, rather than RI, basis. Specifically, the license conditions state that prior NRC review and approval are not required for changes to the NFPA 805, Chapter 3 fundamental FPP elements and design requirements for which an engineering evaluation demonstrates that the alternative to the NFPA 805, Chapter 3 element is functionally equivalent or adequate for the hazard. The licensee may use an engineering evaluation to demonstrate that a change to an NFPA 805, Chapter 3 element is functionally equivalent to the corresponding technical requirement. A qualified fire protection engineer shall perform the engineering evaluation and conclude that the change has not affected the functionality of the component, system, procedure, or physical arrangement (i.e., has not impacted its contribution toward meeting the nuclear safety and radioactive release performance criteria), using a relevant technical requirement or standard.

Use of this approach does not fall under NFPA 805, Section 1.7, "Equivalency," because the condition can be shown to meet the NFPA 805, Chapter 3 requirement. Section 1.7 of NFPA 805 is a standard format used throughout NFPA standards. It is intended to allow owner/operators to use the latest state of the art fire protection features, systems, and equipment, provided the alternatives are of equal or superior quality, strength, fire resistance, durability, and safety. However, the intent is to require approval from the AHJ because not all of these state-of-the-art features are in current use or have relevant operating experience. This is a different situation than the use of functional equivalency because functional equivalency demonstrates that the condition meets the NFPA 805 code requirement.

Alternatively, the licensee may use an engineering evaluation to demonstrate that changes to certain NFPA 805, Chapter 3 elements are acceptable because the changes are "adequate for the hazard." Prior NRC review and approval would not be required for alternatives to four specific sections of NFPA 805, Chapter 3 listed below, for which an engineering evaluation demonstrates that the alternative to the Chapter 3 element is adequate for the hazard. A qualified fire protection engineer shall perform the engineering evaluation and conclude that the change has not affected the functionality of the component, system, procedure, or physical arrangement (with respect to the ability to meet the nuclear safety and radioactive release performance criteria), using a relevant technical requirement or standard. NFPA 805, Section 2.4 states that engineering analysis is an acceptable means of evaluating an FPP against performance criteria. Engineering analyses shall be permitted to be qualitative or

quantitative. Use of qualitative engineering analyses by a qualified fire protection engineer to determine that a change has not affected the functionality of the component, system, procedure or physical arrangement is allowed by NFPA 805, Section 2.4.

The four specific sections of NFPA 805, Chapter 3 for which prior NRC review and approval are not required to implement alternatives that an engineering evaluation has demonstrated are adequate for the hazard are:

1. "Fire Alarm and Detection Systems" (Section 3.8),

2. "Automatic and Manual Water-Based Fire Suppression Systems" (Section 3.9),

3. "Gaseous Fire Suppression Systems" (Section 3.10), and

4. "Passive Fire Protection Features" (Section 3.11).

The engineering evaluations described above (i.e., functionally equivalent and adequate for the hazard) are engineering analyses governed by the NFPA 805 guidelines. In particular, this means that the evaluations must meet the requirements of NFPA 805, Section 2.4, "Engineering Analyses," and NFPA 805, Section 2.7, "Program Documentation, Configuration Control, and Quality." Specifically, the effectiveness of the fire protection features under review must be evaluated and found acceptable in relation to their ability to detect, control, suppress, and extinguish a fire and provide passive protection to achieve the performance criteria and not exceed the damage threshold for the plant being analyzed. The associated evaluations must also meet the documentation content (as outlined by NFPA 805, Section 2.7.1, "Content") and quality requirements (as outlined by NFPA 805, Section 2.7.3, "Quality") of the standard in order to be considered adequate. The NRC staff's review of the licensee's compliance with NFPA 805, Sections 2.7.1 and 2.7.3 is provided in SE Section 3.8.

According to the LAR, the licensee intends to use an FPRA to evaluate the risk of proposed future plant changes. SE Section 3.4.2, "Quality of the Fire Probabilistic Risk Assessment," discusses the technical adequacy of the FPRA, including the licensee's process to ensure that the FPRA remains current. The NRC staff determined that the quality of the licensee's FPRA and associated administrative controls and processes for maintaining the quality of the PRA model is sufficient to support self-approval of future RI changes to the FPP under the proposed license conditions, the NRC staff concludes that the licensee's process for self-approving future FPP changes is acceptable.

The NRC staff also concludes that the FRE methods used at Turkey Point to model the cause and effect relationship of associated changes as a means of assessing the risk of plant changes during transition to NFPA 805 may continue to be used after implementation of the RI/PB FPP, based on the licensee's administrative controls to ensure that the models remain current and to assure continued quality. (See SE Section 3.4.2, "Quality of the Fire Probabilistic Risk Assessment.") Accordingly, these cause and effect relationship models may be used after transition to NFPA 805 as a part of the FREs conducted to determine the change in risk associated with proposed plant changes.

2.7 Modifications and Implementation Items

Regulatory Position C.3.1 of RG 1.205, Revision 1 (Reference 4) states that a license condition included in a NFPA 805 LAR should include (1) a list of modifications being made to bring the plant into compliance with 10 CFR 50.48(c), (2) a schedule detailing when these modifications will be completed, and (3) a statement that the licensee shall maintain appropriate compensatory measures in place until implementation of the modifications are completed.

The list of modifications and implementation items originally submitted in the LAR have been updated by the licensee in the final version of LAR Attachment S, "Plant Modifications and Items to be Completed during Implementation," provided in the licensee's letter dated November 5, 2014 (Reference 18).

2.7.1 Modifications

The NRC staff reviewed LAR Attachment S, as supplemented, which describes the plant modifications necessary to implement the NFPA 805 licensing basis, as proposed. These modifications are identified in the LAR as necessary to bring Turkey Point into compliance with either the deterministic or PB requirements of NFPA 805. As described below, LAR Attachment S, Table S-2, "Plant Modifications Committed," provides a description of each of the proposed plant modifications, presents the problem statement explaining why the modification is needed, and identifies the compensatory actions required to be in place pending completion/implementation of the modification.

The NRC staff confirmed that the modifications identified in LAR Tables S-1 and S-2 are the same as those identified in LAR Table B-3, "Fire Area Transition," on a fire area basis, as the modifications being credited in the proposed NFPA 805 licensing basis. The NRC staff also confirmed that LAR Attachment S, Table S-2 modifications and associated completion schedule are the same as those provided in the proposed NFPA 805 license conditions.

As depicted in LAR Attachment S, Table S-1, "Plant Modifications Completed," the licensee has completed 12 modifications as part of the NFPA 805 transition. In its letter dated November 5, 2014 (Reference 18), the licensee revised LAR Attachment S, Table S-2 and indicated that it completed an additional 17 modifications. LAR Attachment S, Table S-2 provides a detailed listing of the 12 remaining plant modifications that must be completed in order for Turkey Point to be in full accordance with NFPA 805, implement many of the attributes upon which this SE is based, and thereby meet the requirements of 10 CFR 50.48(c). The modifications will be completed in accordance with the schedule provided in the proposed NFPA 805 license condition, which states that all modifications will be in place by the end of the second refueling outage (for each unit) after issuance of the license amendment. In addition, the licensee agreed to keep the appropriate compensatory measures in place until the modifications are complete.

2.7.2 Implementation Items

Implementation Items are items that the licensee has not fully completed or implemented as of the issuance date of the license amendments, but which will be completed during implementation of the license amendments to transition to NFPA 805 (e.g., procedure changes that are still in process, or NFPA 805 programs that have not been fully implemented). The

licensee identified the implementation items in LAR Attachment S, Table S-3. For each implementation item, the licensee and the NRC staff have reached a satisfactory resolution involving the level of detail and main attributes that each remaining change will incorporate upon completion. Completion of these items in accordance with the schedule discussed in SE Section 2.7.3 does not change or impact the bases for the safety conclusions made by the NRC staff in the SE.

Each implementation item will be completed prior to the deadline for implementation of the RI/PB FPP based on NFPA 805, as specified in the license conditions and the letter transmitting the amended license (i.e., implementation period), which states that the implementation items listed in LAR Attachment S, Table S-3, with the exception of Items 12, 18, 19, and 22 will be completed no later than 12 months after issuance of the license amendment. It is further stated that implementation Items 12, 18, and 19, are associated with modifications in LAR Attachment S, Table S-2, and will be completed by the end of the second refueling outage (for each unit) following issuance of the license amendment, and that implementation Item 22 will be completed within 6 months of the NRC approval of the Flowserve Reactor Coolant Pump (RCP) Seal Topical Report.

The NRC staff, through an onsite audit or during a future fire protection inspection, may choose to examine the closure of the implementation items, with the expectation that any variations discovered during this review, or concerns with regard to adequate completion of the implementation item, would be tracked and dispositioned appropriately under the licensee's corrective action program. Any discrepancies identified during onsite audits or fire protection inspections examining dispositioning of the implementation items could be subject to appropriate NRC enforcement action, as completion of the implementation items would be required by the proposed license conditions.

2.7.3 Schedule

LAR Section 5.5, supplemented by the licensee's letters dated November 5, 2014 (Reference 18), and February 18, 2015 (Reference 20), provides the overall schedule for completing the NFPA 805 transition at Turkey Point. With the exception of Implementation Items 12, 18, 19, and 22, the licensee stated that it will complete the implementation of new NFPA 805 FPP to include procedure changes, process updates, and training to affected plant personnel no later than 12 months after issuance of the license amendment. The licensee stated that the 12-month time period is based on site resources required to prepare and support the Turkey Point Unit 3 refueling outage scheduled in the fall of 2015 and the Turkey Point Unit 4 refueling outage scheduled in the spring of 2016, and that the 12-month schedule will ensure implementation of the FPP falls after the Turkey Point Unit 3 fall 2015 refueling outage and prior to the Unit 4 spring 2016 refueling outage.

Implementation Items 12, 18, and 19, are associated with modifications in LAR Attachment S, Table S-2, and will be completed by the end of the second refueling outage (for each unit) following issuance of the license amendment. Implementation Item 22 will be completed within 6 months of the NRC approval of the Flowserve RCP Seal Topical Report.

LAR Section 5.5, supplemented by the licensee's letter dated November 5, 2014, also states that modifications will be completed by the startup of the second refueling outage (for each unit)

after issuance of the SE, and that appropriate compensatory measures will be maintained until modifications are complete.

Based on the information provided by the licensee, the NRC staff concludes that the completion schedules proposed by the licensee for the modifications and implementation items are acceptable.

3.0 TECHNICAL EVALUATION

The following sections evaluate the technical aspects of the LAR (Reference 8) to transition the FPP at Turkey Point to one based on NFPA 805 (Reference 3), in accordance with 10 CFR 50.48(c). While performing the technical evaluation of the licensee's submittal, the NRC staff used the guidance provided in NUREG-0800, Section 9.5.1.2, "Risk Informed, Performance-Based Fire Protection" (Reference 47), to determine whether the licensee had provided sufficient information in both scope and level of detail to adequately demonstrate compliance with the requirements of NFPA 805, as well as the other associated regulations and guidance documents discussed in SE Section 2.0. Specifically:

- Section 3.1 provides the results of the NRC staff review of the licensee's transition of the FPP from the existing deterministic guidance to that of NFPA 805, Chapter 3, "Fundamental FPP and Design Elements."

- Section 3.2 provides the results of the NRC staff review of the methods used by the licensee to demonstrate the ability to meet the NSPC.

- Section 3.3 provides the results of the NRC staff review of the FM methods used by the licensee to demonstrate the ability to meet the NSPC using an FM PB approach.

- Section 3.4 provides the results of the NRC staff review of the fire risk assessments used to demonstrate the ability to meet the NSPC using an FRE PB approach.

- Section 3.5 provides the results of the NRC staff review of the licensee's NSCA results by fire area.

- Section 3.6 provides the results of the NRC staff review of the methods used by the licensee to demonstrate an ability to meet the radioactive release performance criteria.

- Section 3.7 provides the results of the NRC staff review of the NFPA 805 monitoring program developed as a part of the transition to an RI/PB FPP based on NFPA 805.

- Section 3.8 provides the results of the NRC staff review of the licensee's program documentation, configuration control, and quality assurance (QA).

SE Attachments A and B provide additional detailed information that was evaluated by the NRC staff during the course of the review to support the licensee's request to transition to an RI/PB FPP in accordance with NFPA 805 (i.e., 10 CFR 50.48(c)). These attachments are discussed as appropriate in the associated SE sections.

3.1 NFPA 805 Fundamental FPP and Design Elements

NFPA 805, Chapter 3 contains the fundamental elements of the FPP and specifies the minimum design requirements for fire protection systems and features that are necessary to meet the standard. The fundamental FPP elements and minimum design requirements include necessary attributes pertaining to the fire protection plan and procedures; the fire prevention program and design controls; industrial fire brigades; and fire protection SSCs. However, 10 CFR 50.48(c) provides exceptions, modifications, and supplementations to certain aspects of NFPA 805, Chapter 3 as follows:

- 10 CFR 50.48(c)(2)(v) – *Existing cables.* In lieu of installing cables meeting flame propagation tests as required by Section 3.3.5.3 of NFPA 805, a flame-retardant coating may be applied to the electric cables, or an automatic fixed fire suppression system may be installed to provide an equivalent level of protection. In addition, the italicized exception to Section 3.3.5.3 of NFPA 805 is not endorsed.

- 10 CFR 50.48(c)(2)(vi) – *Water supply and distribution.* The italicized exception to Section 3.6.4 of NFPA 805 is not endorsed. Licensees who wish to use the exception to Section 3.6.4 of NFPA 805 must submit a request for a license amendment in accordance with 10 CFR 50.48(c)(2)(vii).

- 10 CFR 50.48(c)(2)(vii) – *Performance-based methods.* While Section 3.1 of NFPA 805 prohibits the use of PB methods to demonstrate compliance with the NFPA 805, Chapter 3 requirements, 10 CFR 50.48(c)(2)(vii) specifically permits that the FPP elements and minimum design requirements of NFPA 805, Chapter 3 may be subject to the PB methods permitted elsewhere in the standard, provided a license amendment is granted and the approach satisfies the performance goals, performance objectives, and performance criteria specified in NFPA 805 related to nuclear safety and radiological release, maintains safety margins, and maintains fire protection defense-in-depth.

Furthermore, Section 3.1 of NFPA 805 specifically allows the use of alternatives to the NFPA 805, Chapter 3 fundamental FPP requirements that have been previously approved by the NRC (the AHJ as denoted in NFPA 805 (Reference 3), and RG 1.205, Revision 1 (Reference 4)), and are contained in the currently approved FPP for the facility.

3.1.1 Compliance with NFPA 805, Chapter 3 Requirements

The licensee used the systematic approach described in NEI 04-02, Revision 2 (Reference 7), as endorsed by the NRC in RG 1.205, Revision 1, to assess the proposed FPP against the NFPA 805, Chapter 3 requirements.

As part of this assessment, the licensee reviewed each section and subsection of NFPA 805, Chapter 3 against the existing FPP and provided specific compliance statements for each Chapter 3 attribute that contained applicable requirements. As discussed below, some subsections of NFPA 805, Chapter 3 do not contain requirements, or are otherwise not applicable, and others are provided with multiple compliance statements to fully document compliance with the element.

The methods used for achieving compliance with the fundamental FPP elements and minimum design requirements are as follows:

1. The existing FPP element directly complies with the requirement: noted in LAR Attachment A, "NEI 04-02, Table B-1, "Transition of Fundamental Fire Protection Program and Design Elements," as "Complies." (See discussion in SE Section 3.1.1.1.)

2. The existing FPP element complies through the use of an explanation or clarification: noted in LAR Attachment A, Table B-1 as "Complies with Clarification." (See discussion in SE Section 3.1.1.2.)

3. The existing FPP element complies through the use of existing engineering equivalency evaluations (EEEEs) whose bases remain valid and are of sufficient quality: noted in LAR Attachment A, Table B-1 as "Complies via Engineering Evaluation." (See discussion in SE Section 3.1.1.3.)

4. The existing FPP element complies with the requirement based on prior NRC approval of an alternative to the fundamental FPP attribute and the bases for the NRC approval remain valid: noted in LAR Attachment A, Table B-1 as "Complies via Previous Approval." (See discussion in SE Section 3.1.1.4.)

5. The existing FPP element does not comply with the requirement, but the licensee is requesting specific approval for a PB method in accordance with 10 CFR 50.48(c)(2)(vii): noted in LAR Attachment A, Table B-1 as "License Amendment Required." (See discussion in SE Section 3.1.1.5.)

The NEI 04-02 based approach was modified in regard to existing FPP elements that comply via previous approval, as described in the licensee's supplemental letters dated March 21, 1979; December 8, 1980; November 8, 1981; and April 19, 1982. For these elements, rather than providing excerpts from both the associated submittal and approval documents as outlined in Appendix B, "Detailed Transition Assessment of Fire Protection Program," of NEI 04-02, the licensee provided only an excerpt from the NRC approval document as a part of the compliance basis statement, on the condition that the excerpt included sufficient information to fully understand the basis for previous approval without the need for additional information from the submittal document.

As discussed further below, the NRC staff determined that, taken together, these methods compose an acceptable approach for documenting compliance with the NFPA 805, Chapter 3 requirements because the licensee followed the compliance strategies identified in the NRC-endorsed NEI 04-02 guidance document. The process defined in the endorsed guidance

provides an organized structure to document each attribute in NFPA 805, Chapter 3, allowing the licensee to provide significant detail on how the program meets the requirements. In addition to the basic strategy of "Complies," which itself makes the attribute able to be both audited and inspected, additional strategies have been provided, allowing for amplification of information, when necessary, regarding how or why the attribute is acceptable.

As discussed in SE Section 2.4.3, fire protection administrative controls refers to procedures put in place by the licensee to establish, implement, and maintain the FPP as required by the licensee's fire protection license condition and 10 CFR 50.48(a); 10 CFR 50.48(c); and NFPA 805, Section 3.2.3. Changes to fire protection administrative controls are controlled by the proposed fire protection license condition (see SE Section 4.0).

The licensee stated in LAR Section 4.2.2, "Existing Engineering Equivalency Evaluation Transition," as supplemented, that it evaluated the EEEEs used to demonstrate compliance with the NFPA 805, Chapter 3 requirements in order to ensure continued appropriateness, quality, and applicability to the current plant configuration. The licensee determined that no EEEEs used to support compliance with NFPA 805 required NRC approval.

EEEEs (previously known as GL 86-10 (Reference 83), evaluations are performed for fire protection design variances such as fire protection system designs and fire barrier component deviations from the specific fire protection deterministic requirements. Once a licensee transitions to NFPA 805, future equivalency evaluations are to be conducted using a PB approach. The evaluation should demonstrate that the specific plant configuration meets the performance criteria in the standard.

Additionally, the licensee stated in LAR Section 4.2.3, "Licensing Action Transition," that the existing licensing actions used to demonstrate compliance have been evaluated to ensure that their bases remain valid. The results of these licensing action evaluations are provided in LAR Attachment K, "Existing Licensing Transition," and LAR Attachment T, "Clarification of Prior NRC Approvals." Clarifications to two of the licensing actions in LAR Attachment K that are being transitioned are provided in LAR Attachment T for review and approval. These were reviewed as part of the NRC staff review of licensing actions to ensure continued validity.

LAR Attachment A, Table B-1 provides further details regarding the licensee's compliance strategy for specific NFPA 805, Chapter 3 requirements, including references to where compliance is documented.

3.1.1.1 Compliance Strategy - Complies

For the majority of the NFPA 805, Chapter 3 requirements, as modified by 10 CFR 50.48(c)(2), the licensee determined that the RI/PB FPP complies directly with the fundamental FPP element using the existing FPP element. In these instances, based on the validity of the licensee's statements, the NRC staff concludes that the licensee's statements of compliance are acceptable.

The following NFPA 805 sections identified in LAR Attachment A, Table B-1 as complying via this method, and any applicable NFPA 805, Chapter 3 implementation items in LAR Attachment S, Table S-3 required additional review by the NRC staff:

3.2.3(1)	3.2.3(3)	3.3	3.3.3	3.3.4
3.3.11	3.4.1(c)	3.4.2.1	3.4.3(a)(2)	3.4.3(b)
3.4.3(c)(3)	3.4.4	3.5.13	3.8.1(1)	

NFPA 805, Section 3.2.3(1) requires that procedures be established for the inspection, testing, and maintenance of fire protection systems. The licensee indicated that station documentation will be updated to reflect the use of EPRI Report TR1006756, "Fire Protection Equipment Surveillance Optimization and Maintenance Guide" (Reference 84). This update of documentation to describe the use of the EPRI Surveillance Frequency Optimization program is identified in LAR Attachment S, Table S-3, Implementation Item 1. The NRC staff concludes that the licensee's statement of compliance is acceptable because the licensee identified a required action that will incorporate the provisions of NFPA 805, Chapter 3 in the licensee's FPP. It included the action as an implementation item in LAR Attachment S, which would be required by the proposed license condition. The use of the EPRI technical report is reviewed in SE Section 3.1.4.

NFPA 805, Section 3.2.3(3) requires that procedures be established to accomplish reviews of FPP performance and trends. The licensee identified that revisions will be made to plant documents to monitor and trend the FPP; develop an NFPA 805 monitoring program evaluation to document the results of the scoping, screening, and risk target value determination; and revise station procedures for fire protection impairments to reflect the results of the scoping and screening tasks. This item is addressed in LAR Attachment S, Table S-3, Implementation Item 2. The NRC staff concludes that the licensee's statement of compliance is acceptable because the licensee identified a required action that will incorporate the provisions of NFPA 805, Chapter 3 in the licensee's FPP and included the action as an implementation item in LAR Attachment S, which would be required by the proposed license condition.

NFPA 805, Section 3.3 requires that a fire prevention program, with the goal of preventing a fire from starting, be established, documented, and implemented as part of the FPP. LAR Attachment C, Table C-2, "NFPA 805 Required Fire Protection Systems and Features," identifies "transient combustible restrictions" as a fire protection feature to reduce risk for Fire Area OD-84. In a letter dated March 15, 2013 (Reference 22), in [Fire Protection Engineering] FPE RAI 07, the NRC staff requested that the licensee describe whether this transient combustible restriction is in addition to the combustible loading controls identified in LAR Attachment A, Table B-1, Section 3.3 and station combustible control procedures. In a letter dated March 18, 2013 (Reference 10), in its response to FPE RAI 07, the licensee indicated that to comply with NFPA 805, Section 4.2.4, additional fire protection features shall be provided in Fire Area OD-84 to balance the risk. Fire Area OD-84 is considered a high-risk fire zone, and therefore, requires a transient combustible permit to introduce any amount of combustible materials into the area other than incidental quantities maintained in direct possession. This is addressed in LAR Attachment S, Table S-3, Implementation Item 17. The NRC staff concludes that the licensee's response to the RAI and statement of compliance are acceptable because the licensee will implement an appropriate combustible control to balance the risk and because the licensee identified a required action that will incorporate the provisions of NFPA 805,

Chapter 3 in the licensee's FPP and included the action as an implementation item in LAR Attachment S, which would be required by the proposed license condition.

NFPA 805, Section 3.3.3 requires that the interior wall or ceiling finish classification be in accordance with NFPA 101, "Life Safety Code" (Reference 63), requirements for Class A materials and that interior floor finishes be in accordance with NFPA 101 requirements for Class I interior floor finishes. In LAR Attachment A, Table B-1, the licensee identified an implementation item to update the applicable coating specifications as required to include the interior finish requirements. This item is addressed in LAR Attachment S, Table S-3, Implementation Item 3. The NRC staff concludes that the licensee's statement of compliance is acceptable because the licensee identified a required action that will incorporate the provisions of NFPA 805, Chapter 3 in the licensee's FPP and included the action as an implementation item in LAR Attachment S, which would be required by the proposed license condition.

NFPA 805, Section 3.3.4 requires that insulation materials be noncombustible. Insulation material includes thermal insulation materials, radiation shielding materials, ventilation duct materials, and soundproofing materials. In FPE RAI 02.e (Reference 22), the NRC staff requested that the licensee clarify compliance with the requirement of NFPA 805, Section 3.3.4 for all these materials except where EEEEs are referenced. In its response to FPE RAI 02.e (Reference 10), the licensee indicated that insulation materials either comply with the requirement of NFPA 805, Section 3.3.4 or have a specific engineering evaluation that demonstrates compliance with this requirement. In its response, the licensee also submitted a change in the compliance basis for LAR Attachment A, Table B-1, Section 3.3.4, to indicate "...The facility is designed in accordance with Criterion 3, which requires that non-combustible and fire resistant materials be used throughout the facility. Non-combustible materials are used to the extent practicable." The licensee also stated that the specification for thermal insulation identifies the acceptable thermal insulation materials and applications for various piping and components and that the specification states, in part, "Certification of 25 or less for flame spread, fuel consumption, and smoke generated when tested in accordance with American Society for Testing and Materials (ASTM) E-84." The licensee also added a new implementation item for LAR Attachment S, Table S-3 to "update appropriate station documentation, as applicable, to include that all insulation materials (thermal insulation, radiation shielding materials, ventilation duct materials, and soundproofing materials) shall be noncombustible or limited combustible." This item is addressed in LAR Attachment S, Table S-3, Implementation Item 24. The NRC staff concludes that the licensee's response to the RAI and statement of compliance are acceptable because the licensee confirmed that all insulation materials shall be noncombustible or limited combustible and because the licensee identified a required action that will incorporate the provisions of NFPA 805, Chapter 3 in the licensee's FPP and included the action as an implementation item in LAR Attachment S, which would be required by the proposed license condition.

NFPA 805, Section 3.3.11 requires that for electrical equipment, adequate clearance, free of combustible material, be maintained around energized electrical equipment. LAR Attachment A, Table B-1 states, "Appropriate plant procedures will be revised to provide instructions for providing adequate clearance free of combustible material around energized electrical equipment." This item is addressed in LAR Attachment S, Table S-3, Implementation Item 6. The NRC staff concludes that the licensee's statement of compliance is acceptable because the licensee identified a required action that will incorporate the provisions of NFPA 805, Chapter 3

in the licensee's FPP and included the action as an implementation item in LAR Attachment S, which would be required by the proposed license condition.

NFPA 805, Section 3.4.1(c) requires that the fire brigade leader and at least two members of the fire brigade have sufficient training and knowledge of nuclear safety systems to understand the effects of fire and fire suppressants on nuclear safety performance (NSP). In FPE RAI 15 (Reference 23), the NRC staff requested that the licensee provide additional discussion regarding how the training and knowledge requirements of NFPA 805 are met. In its response to FPE RAI 15 (Reference 13), the licensee stated:

> Fire Brigade Leader and two members are fully qualified Nuclear System Operators, who received training in systems, Off-Normal Operating Procedures, and Fire Protection. Turkey Point Training and Operations have verified that their level of knowledge is commensurate with that of a Licensed Operator for Safe Shutdown systems needed to lead the fire brigade. The brigade is fully manned by Nuclear System Operators.

The licensee further stated that Nuclear System Operators receive full systems and fire protection training in the initial class and attend requalification classes throughout the year on system operations and fire event impacts to the control room. The licensee further stated that both Nuclear System Operators and Licensed Operators are taught the same level of systems training pertaining to Fire Protection, Alternate Safe Shutdown, and Appendix R systems. The licensee further stated that in addition to the training requirements that fire brigade leader selection requires management approval and is based on experience and integrated plant knowledge. The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee demonstrated that the brigade leader and at least two members of the fire brigade have sufficient training and knowledge of nuclear safety systems in accordance with NFPA 805, Section 3.4.1(c).

NFPA 805, Section 3.4.2.1 requires that the pre-fire plans detail the fire area configuration and fire hazards to be encountered in the fire area, along with any nuclear safety components and fire protection systems and features that are present. LAR Attachment A, Table B-1 states that the pre-fire plans will be revised so that each pre-fire plan identifies the significant credible fire hazards that may be encountered. In addition, components necessary to achieve the NSPC, which require entry to the affected fire area, will be included and the equipment and portions of the fire affected area where RI/PB analysis relies on assumptions that could be affected by fire brigade performance will be included. This item is addressed in LAR Attachment S, Table S-3, Implementation Item 7. The NRC staff concludes that the licensee's statement of compliance is acceptable because the licensee identified a required action that will incorporate the provisions of NFPA 805, Chapter 3 in the licensee's FPP and included the action as an implementation item in LAR Attachment S, which would be required by the proposed license condition.

NFPA 805, Section 3.4.3(a)(2) requires that Industrial fire brigade members be given quarterly training and practice in firefighting, including radioactivity and health physics considerations, to ensure that each member is thoroughly familiar with the steps to be taken in the event of a fire. LAR Attachment A, Table B-1 states, "Appropriate procedures will be revised to contain a discussion about training in radioactivity and health physics considerations." This item is addressed in LAR Attachment S, Table S-3, Implementation Item 8. The NRC staff concludes

that the licensee's statement of compliance is acceptable because the licensee identified a required action that will incorporate the provisions of NFPA 805, Chapter 3 in the licensee's FPP and included the action as an implementation item in LAR Attachment S, which would be required by the proposed license condition.

NFPA 805, Section 3.4.3(b) requires that plant personnel who respond with the industrial fire brigade be trained as to their responsibilities, potential hazards to be encountered, and interfacing with the industrial fire brigade. LAR Attachment A, Table B-1 states, "The appropriate procedures will be updated to address the training of personnel who respond with the fire brigade." This item is addressed in LAR Attachment S, Table S-3, Implementation Item 9. The NRC staff concludes that the licensee's statement of compliance is acceptable because the licensee identified a required action that will incorporate the provisions of NFPA 805, Chapter 3 in the licensee's FPP and included the action as an implementation item in LAR Attachment S, which would be required by the proposed license condition.

NFPA 805, Section 3.4.3(c)(3) requires that the industrial fire brigade drills be conducted in various plant areas, especially in those areas identified to be essential to plant operation and to contain significant fire hazards. LAR Attachment A, Table B-1 states, "As part of the plant upgrade for compliance with NFPA 600 (Reference 85), the appropriate procedures will be revised to address this requirement." This item is addressed in LAR Attachment S, Table S-3, Implementation Item 10. The NRC staff concludes that the licensee's statement of compliance is acceptable because the licensee identified a required action that will incorporate the provisions of NFPA 805, Chapter 3 in the licensee's FPP and included the action as an implementation item in LAR Attachment S, which would be required by the proposed license condition.

NFPA 805, Section 3.4.4 requires that the firefighting equipment such as protective clothing, respiratory protective equipment, radiation monitoring equipment, personal dosimeters, and fire suppression equipment such as hoses, nozzles, fire extinguishers, and other needed equipment be provided for the industrial fire brigade and that this equipment shall conform with applicable NFPA standards. LAR Attachment A, Table B-1 states, "The appropriate procedures will be revised to ensure more controls are in place to meet this requirement." This item is addressed in LAR Attachment S, Table S-3, Implementation Item 11. The NRC staff concludes that the licensee's statement of compliance is acceptable because the licensee identified a required action that will incorporate the provisions of NFPA 805, Chapter 3 in the licensee's FPP and included the action as an implementation item in LAR Attachment S, which would be required by the proposed license condition.

NFPA 805, Section 3.5.13 identifies certain requirements for inside header piping that supplies sprinkler and standpipe systems. The licensee indicated "N/A" for a compliance strategy regarding this requirement and stated that the plant does not use this arrangement. In FPE RAI 12 (Reference 23), the NRC staff requested that the licensee provide a description of the piping arrangement, including any piping codes that apply. The NRC staff also requested that the licensee include a description of how each sprinkler and standpipe system is equipped with an approved shutoff valve as required by NFPA 805, Section 3.5.13. In its response to FPE RAI 12 (Reference 13), the licensee stated that there are no seismically analyzed hose standpipe systems per NFPA 805, Section 3.6.4, and therefore, the American National Standards Institute (ANSI) B31.1, "Code for Power Piping," requirements for headers inside buildings are not

applicable. The licensee further stated that a review of the piping specifications determined that fire protection piping is ANSI B31.1 classified. The licensee further stated that each sprinkler system is equipped with an OS&Y [outside screw and yoke], or other approved shutoff valve, and that each standpipe system is not provided with an individual isolation valve, but that standpipes have either individual isolation capability or sections that can be isolated. The licensee also provided a revision to the LAR changing the compliance strategy to be "complies," "complies via Engineering Evaluation," and added to the compliance basis. The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee demonstrated how the sprinkler and standpipe systems meet NFPA 805, Section 3.5.13 for meeting ANSI B31.1 and the ability to be appropriately isolated.

NFPA 805, Section 3.8.1(1) requires that the actuation of any fire detection device be transmitted to the control room or other constantly attended location. LAR Attachment A, NEI 04-02, Table B-1, "Transition of Fundamental FP Program and Design Elements," states, "All areas in the power block will alarm in a constantly attended location after a modification to the fire detection system." This item is addressed in LAR Attachment S, Table S-3, Implementation Item 12. The NRC staff concludes that the licensee's statement of compliance is acceptable because the licensee identified a required action that will incorporate the provisions of NFPA 805, Chapter 3 in the licensee's FPP and included the action as an implementation item in LAR Attachment S, which would be required by the proposed license condition.

The NRC staff concludes that the licensee's statements of compliance are acceptable because completion of the implementation items identified in LAR Attachment S, Table S-3 would be required by the proposed license condition and will bring these attributes into compliance with the requirements of NFPA 805.

3.1.1.2 Compliance Strategy – Complies with Clarification

For four of the NFPA 805, Chapter 3 requirements, the licensee provided additional clarification when describing its means of compliance with the fundamental FPP element. In these instances, the NRC staff reviewed the additional clarifications and concludes that the licensee will meet the underlying requirement for the FPP element as clarified.

The following NFPA 805 sections identified in LAR Attachment A, Table B-1 as complying via this method required additional review by the NRC staff:

3.3.1.2(5)	3.3.1.2(6)	3.3.1.3.1	3.11.3(3)

NFPA 805, Section 3.3.1.2(5) requires that controls on the use and storage of flammable and combustible liquids be in accordance with NFPA 30, "Flammable and Combustible Liquids Code" (Reference 64) or other applicable NFPA standards. The licensee identified a clarification to the requirement that indicated that upon examination of the pre-transition FPP, no other NFPA standards were identified to be applicable. The NRC staff concludes that the licensee's statement of compliance is acceptable because the licensee indicated that no other standards are applicable to the storage and use of flammable and combustible liquids that follow the guidance provided in NEI 04-02.

NFPA 805, Section 3.3.1.2 (6) requires that controls on the use and storage of flammable gases be in accordance with applicable NFPA standards. The licensee identified a clarification to the stated requirement that indicates while procedures are in place to control flammable gases, it is not committed to any flammable gas standards. The NRC staff concludes that the licensee's statement of compliance is acceptable because the licensee indicated that no other standards are applicable to the storage and use of flammable gases that follow the guidance provided in NEI 04-02.

In FPE RAIs 02.c (Reference 22), and FPE RAI 02.c.01 (Reference 23), the NRC staff requested that the licensee identify those controls being relied upon for control of use and storage of flammable gases. In its response to FPE RAIs 02.c (Reference 10) and FPE RAI 02.c.01 (Reference 13), the licensee identified that flammable gases are programmatically controlled by station procedure, and that controls identified include:

- Locations for storage.
- When in storage, cylinders shall always be placed upright, with their caps in place, in approved storage areas away from sources of heat (i.e., radiators, furnaces).
- When a cylinder is not in use, the valve shall be closed and hoses relieved of pressure.
- Cylinders shall be labeled as 'flammable,' if applicable.
- When handling flammable gas cylinders, gas release to the atmosphere shall be avoided so that a means for combustion or an explosion will not be provided.
- Cylinders should never be subjected to temperatures above 125 degrees Fahrenheit (°F).
- No smoking signs shall be posted in areas where any flammable cylinders are stored.
- In areas where cylinders are being handled, adequate and appropriate fire extinguishing capability shall be provided.
- Cylinders shall be secured so that they cannot be knocked over.
- Compressed flammable and oxygen gas cylinders should be left on a wheeled cart to expedite removal if necessary.

The licensee further identified the need to update site administrative procedures for control of combustibles to be applicable to all power block structures. The licensee revised the LAR and added Implementation Item 20 to LAR Attachment S, Table S-3. The NRC staff concludes that the licensee's responses to the RAIs and statement of compliance are acceptable because the licensee described the administrative controls that are in place for flammable gases and

because the licensee identified a required action that will incorporate the provisions of NFPA 805, Chapter 3 in the licensee's FPP and included the action as an implementation item in LAR Attachment S, which would be required by the proposed license condition.

NFPA 805, Section 3.3.1.3.1 requires that a hot work safety procedure be developed, implemented, and periodically updated as necessary in accordance with NFPA 51B, "Standard for Fire Prevention During Welding, Cutting, and Other Hot Work" (Reference 65), and NFPA 241, "Standard for Safeguarding Construction, Alteration, and Demolition Operations" (Reference 68). The licensee identified a clarification to the stated requirement in that the licensee's compliance with NFPA 241 is addressed through compliance with NFPA 51B, since NFPA 241 (2000 Edition), as referenced by NFPA 805, relies on NFPA 51B for hot work requirements. Additionally, the licensee indicated that it performed a code compliance review for NFPA 51B. The NRC staff concludes that the licensee's statement of compliance is acceptable because the licensee demonstrated compliance with NFPA 805, Section 3.3.1.3.1 by using NFPA 51B.

NFPA 805, Section 3.11.3(3) requires that passive fire protection devices such as doors and dampers conform with the following NFPA standards: (1) NFPA 80, "Standard for Fire Doors and Fire Windows" (Reference 86); (2) NFPA 90A, "Standard for the Installation of Air-Conditioning and Ventilating Systems" (Reference 87); and (3) NFPA 101, "Life Safety Code" (Reference 63). The licensee identified a clarification to the stated requirement in that the licensee's compliance with NFPA 101 is addressed through compliance with NFPA 80 and NFPA 90A, since NFPA 101 relies on NFPA 80 and NFPA 90A for the requirements for passive fire protection devices. Additionally, the licensee indicated that detailed code compliance reviews were performed for both NFPA 80 and NFPA 90A. The NRC staff concludes that the licensee's statement of compliance is acceptable because the licensee demonstrated compliance with NFPA 805, Section 3.11.3(3) by using NFPA 101.

3.1.1.3 Compliance Strategy - Complies via Engineering Evaluations

In several of the NFPA 805, Chapter 3 requirements, the licensee demonstrated compliance with the fundamental FPP element through the use of EEEEs. In FPE RAI 02.a (Reference 22), the NRC staff requested that the licensee provide a positive statement regarding the EEEEs relied upon for compliance in fundamental elements of Chapter 3 compliance strategy or relied upon for Chapter 4 compliance with fire protection features deemed "adequate for the hazard." In its response to FPE RAI 02.a (Reference 10), the licensee stated, "The evaluations were the appropriate use of the process, the evaluations were technical(ly) adequate for transition, the evaluations are not based solely on quantitative risk evaluations, and the evaluations reflect the as-built plant configuration (bases still valid)." The licensee also proposed revised wording for LAR Section 4.2.2, indicating that all EEEEs have been reviewed to determine the evaluation is technically adequate and the bases for acceptability are valid. The NRC staff concludes that the licensee's responses to the RAI and statement of compliance are acceptable because the licensee provided additional information that demonstrated appropriate use of EEEEs.

The following NFPA 805, Chapter 3 sections, identified in LAR Attachment A, Table B-1 as complying via this method, and any applicable NFPA 805, Chapter 3 implementation items in LAR Attachment S, Table S-3 required additional review by the NRC staff:

3.3.7.1 3.11.5

For NFPA 805, Section 3.3.7.1, the licensee identified LAR Attachment S, Table S-3, Implementation Item 5, to address additional NFPA 50A, "Standard for Gaseous Hydrogen Systems at Consumer Sites" (Reference 88), code requirements. The NRC staff concludes that the licensee's statement of compliance is acceptable. This is because the licensee identified a required action that will incorporate the provisions of NFPA 805, Chapter 3 in the licensee's FPP and included the action as an implementation item in LAR Attachment S, which would be required by the proposed license condition.

NFPA 805, Section 3.11.5, contains requirements for electrical raceway fire barrier systems (ERFBSs). In LAR Attachment A, Table B-1, the licensee identified two compliance strategies for this element: (1) "Complies by previous approval," and (2) "Complies by engineering evaluation." In SSD RAI 04 (Reference 22), the NRC staff requested that the licensee provide clarification concerning the fire resistance ratings credited and hazard evaluations performed by the licensee. In its response to SSD RAI 04 (Reference 10), the licensee modified the credit taken for ERFBS; changed the compliance strategy in LAR Attachment A, Table B-1 to remove the "Complies by Previous Approval" compliance strategy; and corrected entries in LAR Attachment C, Table C-2, "NFPA 805 Required Fire Protection Systems and Features." The NRC staff identified that, as revised, LAR Attachment C, Table C-2 eliminated reliance on ERFBS in Fire Zones 79, 80, 82, 84, 85, 88, 91, 92, 105, and 117. The NRC staff concludes that the licensee's response to the RAI and statement of compliance are acceptable because the licensee revised the compliance statement to appropriately reflect the correct compliance strategy of complies by engineering evaluation.

LAR Attachment C, Table C-1, "NFPA 805 Ch 4 Compliance (NEI 04-02, Table B-3)," indicates that some fire areas (i.e., CC and HH) will have new ERFBS installed. In SSD RAI 05 (Reference 22), the NRC staff requested additional information to describe the performance criteria, design standard, and fire testing criteria that will be established for these installations. Specifically, the NRC staff requested that the licensee describe how the compliance strategy identified in LAR Attachment A, Table B-1 addresses these specific applications of ERFBS for the NFPA 805 transition. In its response to SSD RAI 05 (Reference 10), the licensee indicated that new ERFBS installations will be in accordance with approved configurations for the required fire resistance rating and that the approved configurations will be tested in accordance with, and will meet, the acceptance criteria in GL 86-10, Supplement 1 (Reference 89). The NRC staff concludes that the licensee's response to the RAI and statement of compliance are acceptable because the licensee indicated that new ERFBS will be installed in accordance with the approved configurations and applicable guidance documents that will incorporate the provisions of NFPA 805.

3.1.1.4 Compliance Strategy - Complies via Previous Approval

Certain NFPA 805, Chapter 3 requirements were supplanted by alternatives that were previously approved by the NRC. NRC staff approval was documented in:

1. March 21, 1979 – An FPP SER to the Turkey Point Unit 3 and 4 Operating License (Reference 27);

2. April 16, 1984 – The plant's alternate SSD capability was reviewed and approved by the NRC 1984 SER (Reference 34);

3. April 19, 1982 – the NRC-issued License Amendments No. 84 and No. 78 to Turkey Point, Unit Nos. 3 and 4, respectively, regarding changes to the TSs (Reference 90);

4. May 5, 1999 – Issuance of a Revised Exemption and its Supporting Safety Evaluation for Fire Barriers in the Turbine Building (Reference 41);

5. December 8, 1980 – NRC Letter to FPL, Reactor Coolant Pump Oil Collection System (Reference 30).

In each instance, the licensee evaluated the basis for the original NRC approval and determined that, in all cases, the bases were still valid. The NRC staff reviewed the information provided by the licensee and concludes that previous NRC approval has been demonstrated using suitable documentation that meets the approved guidance contained in RG 1.205, Revision 1 (Reference 4). Based on the licensee's statements for the continued validity of the previously approved alternatives to the NFPA 805, Chapter 3 requirements, the NRC staff concludes the licensee's statements of compliance in these instances are acceptable.

The following NFPA 805 section identified in LAR Attachment A, Table B-1 as complying via this method required additional review by the NRC staff:

3.3.5.3

NFPA 805, Section 3.3.5.3 requires that electric cable construction comply with a flame propagation test as acceptable to the AHJ. LAR Attachment A, Section 3.3.5.3 indicated the licensee's reliance on previous NRC approval for currently installed cables. In FPE RAI 02.f (Reference 22), the NRC staff requested that the licensee provide clarification regarding whether new cable installations will comply with NFPA 805, Section 3.3.5.3. In its response to FPE RAI 02.f (Reference 10), the licensee stated that "new cable installations require compliance with NFPA 805, Section 3.3.5.3." The NRC staff concludes that the licensee's response to the RAI and statement of compliance are acceptable because the licensee indicated compliance with NFPA 805, Section 3.3.5.3 for new cable installations.

3.1.1.5 Compliance Strategy – License Amendment Required

The licensee requested approval for the use of PB methods to demonstrate compliance with fundamental FPP elements. In accordance with 10 CFR 50.48(c)(2)(vii), the licensee requested

specific approvals be included in the license amendments approving the transition to NFPA 805. The NFPA 805 sections identified in LAR Attachment A, Table B-1 as complying via this method are as follows:

- 3.3.3, which concerns the use of epoxy floor coatings as compliant with NFPA 805, Section 3.3.3. The licensee performed an evaluation of the epoxy floor coatings and found them to be acceptable. The licensee requested NRC approval of a PB method to justify the use of epoxy floor coatings as an interior finish, thereby meeting the requirements of NFPA 805, Section 3.3.3. (See SE Section 3.1.4.1 for the NRC staff's evaluation of this request.)

- 3.3.5.1, which concerns the use of non-listed video/communication/data cables routed above suspended ceilings. The licensee requested NRC approval of a PB method to justify the use of unqualified cables currently installed above suspended ceilings in the power block, thereby meeting the requirements of NFPA 805, Section 3.3.5.1. (See SE Section 3.1.4.2 for the NRC staff's evaluation of this request.)

- 3.3.5.2, which concerns the use of polyvinyl chloride or high-density polyethylene (PVC/HDPE) conduits in embedded installations in some areas of the power block. The licensee requested NRC approval of a PB method to justify the use of PVC/HDPE conduits for embedded conduit in certain electrical raceway installations that are within a noncombustible enclosure, which provides protection from mechanical damage and from damage resulting from either an exposure fire or from a fire within the conduit impacting other targets, thereby meeting the requirements of NFPA 805, Section 3.3.5.2. (See SE Section 3.1.4.3 for the NRC staff's evaluation of this request.)

- 3.3.12(1), which concerns the allowance for the potential of oil misting from the RCPs, due to normal motor consumption not captured by the oil collection system designed for pressurized and non-pressurized leakage and spillage. The licensee requested NRC approval of a PB method for its clarification that oil misting as a result of pump/motor operation be excluded from the oil collection system, thereby meeting the requirements of NFPA 805, Section 3.3.12(1). (See SE Section 3.1.4.4 for the NRC staff's evaluation of this request.)

- 3.5.5 and 3.9.4, which concern the lack of a fire rated separation between fire pumps and the lack of automatic suppression protection over the diesel-driven fire pump. The licensee requested NRC approval of a PB method for an alternative configuration, thereby meeting the requirements of NFPA 805, Sections 3.5.5 and 3.9.4. (See SE Section 3.1.4.5 for the NRC staff's evaluation of this request.)

- 3.8.1(2) and 3.9.3, which concern the lack of alarms on automatic water-based suppression systems to a constantly attended location. The licensee requested NRC approval for the use of a PB method for currently installed systems that do not prevent the suppression system from actuating and performing the design

function to control a fire, thereby meeting the requirements of NFPA 805, Sections 3.8.1(2) and 3.9.3. (See SE Section 3.1.4.6 for the NRC staff's evaluation of this request.)

- 3.3.8 and NFPA 30 Sections 2-1.1.1, 2-2.4.2, 2-4.4.3, and 2-5.2, which concern flammable and combustible liquid storage requirements. The licensee requested NRC approval for the use of a PB method for certain storage requirements for currently installed configurations, thereby meeting the requirements of NFPA 805, Section 3.3.8 and NFPA 30 Sections 2-1.1.1, 2-2.4.2, 2-4.4.3, and 2-5.2. (See SE Section 3.1.4.7 for the NRC staff's evaluation of this request.)

- 3.2.3(1), which concerns inspection, testing, and maintenance requirements subject to PB methods permitted elsewhere in the standard. In a letter dated March 18, 2013 (Reference 10), the licensee requested NRC approval to manage inspection, testing, and maintenance requirements within the guidelines of EPRI Technical Report (TR)-1006756 (Reference 84), thereby meeting the requirements of NFPA 805, Section 3.2.3(1). (See SE Section 3.1.4.8 for the NRC staff's evaluation of this request.)

As discussed in SE Section 3.1.4, the NRC staff concludes that the use of PB methods to demonstrate compliance with these fundamental FPP elements is acceptable.

3.1.1.6 Compliance Strategy - Multiple Strategies

In certain compliance statements of the NFPA 805, Chapter 3 requirements, the licensee used more than one of the above strategies to demonstrate compliance with aspects of the fundamental element.

In each of these cases, the NRC staff concludes that the individual compliance statements are acceptable, the combination of compliance strategies is acceptable, and the licensee demonstrated compliance with the NFPA 805, Chapter 3 fundamental FPP elements and minimum design requirements.

3.1.1.7 Chapter 3 Sections not Reviewed

In LAR Attachment A, the licensee identified compliance strategies for the requirements of NFPA 805, Chapter 3 and also included those sections of NFPA 805, Chapter 3 that either do not apply to the transition to an RI/PB FPP or have no technical requirements. Accordingly, the NRC staff did not review these sections for acceptability. The sections that were not reviewed fall into one of the following categories:

- Sections that do not contain any technical requirements (e.g., NFPA 805, Section 3.4.5 includes requirements for the off-site fire department interface and does not contain any technical requirements).

- Sections that are not applicable because of the following:

- The licensee stated that there are no systems of this type installed (e.g., in LAR Attachment A, Table B-1, for NFPA 805, Section 3.9.1, the licensee stated that no water mist or foam systems are installed. In LAR Attachment A, Table B-1, for NFPA 805, Section 3.10.1, the licensee stated that there are no clean agent or carbon dioxide systems installed).

- The type of system, while installed, is not required under the RI/PB FPP (e.g., in LAR Attachment A, Table B-1, for NFPA 805, Section 3.10.4, the licensee stated that there are no backup gaseous systems).

- The requirements are structured with an applicability statement (e.g., in LAR Attachment A, Table B-1, for NFPA 805, Sections 3.4.1(a)(2) and 3.4.1(a)(3), the licensee stated that NFPA 600, "Standard on Industrial Fire Brigades" (Reference 85) applies in lieu of NFPA 1500, "Standard on Fire Department Occupational Safety and Health Program" (Reference 91), or NFPA 1582, "Standard on Medical Requirements for Fire Fighters and Information for Fire Department Physicians" (Reference 92)).

3.1.1.8 Compliance with Chapter 3 Requirements Conclusion

As discussed above, the NRC staff evaluated the results of the licensee's assessment of the proposed RI/PB FPP against the NFPA 805, Chapter 3 fundamental FPP elements and minimum design requirements, as modified by the exceptions, modifications, and supplementations in 10 CFR 50.48(c)(2). Based on this review of the licensee's submittal, as supplemented, the NRC staff concludes that the RI/PB FPP is acceptable with respect to the fundamental FPP elements and minimum design requirements of NFPA 805, Chapter 3 as modified by 10 CFR 50.48(c)(2), because the licensee:

- Used an overall process consistent with NRC staff approved guidance to determine the state of compliance with each of the applicable NFPA 805, Chapter 3 requirements.

- Provided appropriate documentation of Turkey Point's state of compliance with the NFPA 805 requirements, which adequately demonstrated compliance by substantiating that the licensee complied:

  - With the requirement directly or with the requirement directly after the completion of an implementation item;

  - With the intent of the requirement (or element) given adequate justification;

  - Via previous NRC staff approval of an alternative to the requirement;

  - Through the use of an engineering equivalency evaluation;

  - Through the use of a combination of the above methods; and

- Through the use of a PB method that the NRC staff has specifically approved in accordance with 10 CFR 50.48(c)(2)(vii).

3.1.2 Identification of the Power Block

The NRC staff reviewed the licensee's structures identified in LAR Attachment I, "Definition of Power Block," Table I-1, "Power Block Definition," as comprising the "power block." The plant structures listed are established as part of the power block for the purpose of denoting the structures and equipment included in the RI/PB FPP that have additional requirements in accordance with 10 CFR 50.48(c) and NFPA 805. As stated in LAR, Section 4.1.3, the power block and plant refer to structures that have equipment required for nuclear plant operations such as the containment, auxiliary building, control building, fuel buildings, emergency diesel generator (EDG) buildings, radioactive waste processing, raw water storage and treatment, turbine building, and intake structure.

The licensee stated that it evaluated the structures in the protected area to determine those that contain equipment required to meet the nuclear safety and radioactive release criteria described in NFPA 805, Section 1.5. The licensee further stated that for structures within the protected area, it examined each structure for the potential to affect power plant operation, affect the ability to achieve and maintain the fuel in a safe and stable condition in the event of a fire, or contain radioactive materials that could be released in the event of a fire. The licensee further stated that the area outside the protected area contains structures such as parking lots, training facilities, fossil plants, switchyard, recreation facilities, natural areas, and that none of those structures affect nuclear plant operations and none contain radioactive materials with credible release potential.

In FPE RAI 03 (Reference 22), the NRC staff requested that the licensee clarify which structures are identified in "Outdoor Area East of Turbine Building." In its response to FPE RAI 03 (Reference 10), the licensee identified structures associated with the "Outdoor Area East of Turbine Building" as follows:

- CC/79A Units 3 and 4 Auxiliary Building North-South Breezeway,
- OD/79 Outdoor Area West of Unit 4 Containment,
- OD/84 Units 3 and 4 Auxiliary Feedwater Pump Area,
- OD/88 Unit 3 Switchgear/Diesel Generator Building Vestibule,
- OD/89 Unit 3 Condensate Storage Tank Area,
- OD/113 Unit 4 Feedwater Platform,
- OD/114 Unit 4 Main Steam Header Platform,

- OD/115 Unit 3 Main Steam Header Platform, and
- OD/116 Unit 3 Feedwater Platform.

In FPE RAI 04 (Reference 22), the NRC staff requested clarification regarding why the switchyard is not considered an area of the power block. In its response to FPE RAI 04 (Reference 10), the licensee stated that the switchyard is excluded from the power block definition. The licensee further indicated that although Fire Zone 128 (switchyard) may be considered in the FPRA, it is not located inside the protected area, does not contain circuits or equipment essential to SSD capability, is not essential to power plant operation, and is not essential to radioactive release mitigation and therefore is not included in the power block.

The NRC staff concludes that the licensee appropriately evaluated the structures and equipment, and adequately documented a list of those structures that fall under the definition of "power block" in NFPA 805.

3.1.3 Closure of GL 2006-03, Hemyc and MT Fire Barrier Issues

GL 2006-03 requested that licensees evaluate their facilities to confirm compliance with existing applicable regulatory requirements in light of the results of NRC testing that determined both Hemyc™ and MT™ fire barriers failed to provide the protective function intended for compliance with existing regulations for the configurations tested using the NRC's thermal acceptance criteria. In a letter dated June 9, 2006 (Reference 93), the licensee stated that it used Thermo-Lag systems for raceway protection and neither Hemyc nor MT fire barrier material were relied upon for separation and/or SSD purposes nor credited in any analyses. Since neither Hemyc nor MT ERFBS were used, the NRC staff concludes that the generic issue, GL 2006-03 (Reference 62), related to the use of these ERFBS is not applicable.

3.1.4 Performance-Based Methods for NFPA 805, Chapter 3 Elements

In accordance with 10 CFR 50.48(c)(2)(vii), a licensee may request NRC approval for use of the PB methods permitted elsewhere in the standard as a means of demonstrating compliance with the prescriptive FPP fundamental elements and minimum design requirements of NFPA 805, Chapter 3. The director or designee may approve PB methods if the director or designee determines that the PB approach:

(A) Satisfies the performance goals, objectives, and criteria specified in NFPA 805 related to nuclear safety and radiological release;

(B) Maintains safety margins; and

(C) Maintains fire protection DID (fire prevention, fire detection, fire suppression, mitigation, and post-fire SSD capability).

NFPA 805, Section 1.3.1, "Nuclear Safety Goal," states:

> The nuclear safety goal is to provide reasonable assurance that a fire during any operational mode and plant configuration will not prevent the plant from achieving and maintaining the fuel in a safe and stable condition.

NFPA 805, Section 1.3.2, "Radioactive Release Goal," states:

> The radioactive release goal is to provide reasonable assurance that a fire will not result in a radiological release that adversely affects the public, plant personnel, or the environment.

NFPA 805, Section 1.4.1, "Nuclear Safety Objectives," states:

> In the event of a fire during any operational mode and plant configuration, the plant shall be as follows:
>
> (1) *Reactivity Control.* Capable of rapidly achieving and maintaining subcritical conditions.
>
> (2) *Fuel Cooling.* Capable of achieving and maintaining decay heat removal and inventory control functions.
>
> (3) *Fission Product Boundary.* Capable of preventing fuel clad damage so that the primary containment boundary is not challenged.

NFPA 805, Section 1.4.2, "Radioactive Release Objective," states:

> Either of the following objectives shall be met during all operational modes and plant configurations.
>
> (1) Containment integrity is capable of being maintained.
>
> (2) The source term is capable of being limited.

NFPA 805, Section 1.5.1, "Nuclear Safety Performance Criteria," states:

> Fire protection features shall be capable of providing reasonable assurance that, in the event of a fire, the plant is not placed in an unrecoverable condition. To demonstrate this, the following performance criteria shall be met:
>
> (a) *Reactivity Control.* Reactivity control shall be capable of inserting negative reactivity to achieve and maintain subcritical conditions. Negative reactivity inserting shall occur rapidly enough such that fuel design limits are not exceeded.
>
> (b) *Inventory and Pressure Control.* With fuel in the reactor vessel, head on and tensioned, inventory and pressure control shall be capable of

controlling coolant level such that subcooling is maintained for a PWR [pressurized-water reactor] and shall be capable of maintaining or rapidly restoring reactor water level above top of active fuel for a BWR [boiling-water reactor] such that fuel clad damage as a result of a fire is prevented.

(c) *Decay Heat Removal.* Decay heat removal shall be capable of removing sufficient heat from the reactor core or spent fuel such that fuel is maintained in a safe and stable condition.

(d) *Vital Auxiliaries.* Vital auxiliaries shall be capable of providing the necessary auxiliary support equipment and systems to assure that the systems required under (a), (b), (c), and (e) are capable of performing their required nuclear safety function.

(e) *Process Monitoring.* Process monitoring shall be capable of providing the necessary indication to assure the criteria addressed in (a) through (d) have been achieved and are being maintained.

NFPA 805, Section 1.5.2, "Radioactive Release Performance Criteria," states:

> Radiation release to any unrestricted area due to the direct effects of fire suppression activities (but not involving fuel damage) shall be as low as reasonably achievable and shall not exceed applicable 10 CFR, Part 20, Limits.

In LAR Attachment L, "NFPA 805, Chapter 3 Requirements for Approval (10 CFR 50.48(c)(2)(vii))," the licensee requested NRC staff review and approval of PB methods to demonstrate an equivalent level of fire protection for the requirements of the NFPA 805, Chapter 3 elements identified in SE Section 3.1.1.5. The NRC staff's evaluation of these proposed methods is provided below.

3.1.4.1 NFPA 805, Section 3.3.3, Interior Finishes

In LAR Attachment L, Approval Request 1, the licensee requested review and approval of a PB method to demonstrate an equivalent level of fire protection for the requirements of NFPA 805, Section 3.3.3 for the use of an epoxy floor coating as an interior finish.

The licensee stated that the critical radiant flux of the epoxy floor coating system is not readily available, but that an evaluation was performed of the combustibility of the epoxy floor coatings. The licensee further stated that the floor coating specifications were reviewed and it was determined that the maximum floor coating thickness used was 62 mils and that a review of manufacturer data of the coatings used indicated that the ASTM E-84 flame spread value for a 49 mils thick epoxy floor coating system similar to the licensee's coating system is 30. The licensee stated that the basis for the approval request of the deviation is as follows:

- The form in which the epoxy floor coating is used and conditions anticipated would meet the definition of a limited combustible material;

- The maximum floor coating thickness used is 62 mils (significantly less than 1/8 inch or 125 mils listed in Information Notice (IN) 2007-26 (Reference 94));

- The ASTM E-84 (Reference 95), flame spread test value of the epoxy coating system at the slightly larger thickness is anticipated to have a flame spread rating less than 50;

- The epoxy floor coating is at the floor level. The ASTM E-84 test is conducted with the material on the ceiling of a tunnel test stand. This configuration would allow the flame to directly impinge on the ceiling surface, enhancing flame spread. With the material on the floor, the heat flux to the surface is much less than would be expected in the ceiling configuration since the convective flame is directing the heat away from the surface. This would mean that the overall flame spread would be expected to be much less, even with a slightly greater thickness; and

- The epoxy coating with the aforementioned criteria would not result in propagation across barriers or between redundant success paths.

In FPE RAI 02.d (Reference 22), the NRC staff requested a more detailed technical justification of the extrapolation of flame spread with regard to increasing thickness of coatings. In its response to FPE RAI 02.d (Reference 10), the licensee indicated that using a linear interpolation, the flame spread value for the 62 mils thick epoxy coating system from the vendor test data of 49 mils, giving flame spread results of 30, is (62/49) * 30 = 38. The licensee further stated that there is sufficient margin between the allowable ASTM E-84 flame spread value of 50 and the value calculated above for the most challenging coating configuration, and therefore, the combustibility of the coating system applied is not considered a significant source of combustible loading. The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee demonstrated that the epoxy floor coating system used has a flame spread rating of less than 50.

The licensee stated that the use of epoxy floor coating does not affect nuclear safety because it meets the definition of a limited combustible material. The licensee further stated that application of epoxy floor coatings is controlled via specifications to ensure that the amount of material does not add appreciable amounts of combustible material to the plant and that the epoxy coating would not result in propagation across barriers or between redundant success paths, and therefore, there is no impact on the NSPC.

The licensee stated that the use of epoxy floor coatings has no impact on the radiological release performance criteria and that the radiological release review was performed based on the manual fire suppression activities in areas containing or potentially containing radioactive materials and is not dependent on the floor coating materials. The licensee further stated that the floor coatings do not change the results of the radiological release evaluation performed that concluded potentially contaminated water is contained and smoke is monitored and floor coatings do not add additional radiological materials to the area or challenge systems boundaries.

The licensee stated that epoxy floor coatings meet the definition of a limited combustible material, and therefore, the safety margin inherent in the analysis for the fire event has been preserved. The licensee further stated that the floor coating materials were evaluated to have a negligible effect on combustibility, the application of epoxy floor coatings is controlled via procedure, the areas with epoxy floor coatings have been analyzed in their current configuration, and the precautions and limitations on the use of these materials do not impact the analysis of the fire event, and therefore, the inherent safety margin and conservatisms in these analysis methods remain unchanged.

The licensee stated that the three echelons of DID described in NFPA 805, Section 1.2 are to (1) prevent fires from starting (combustible/hot work controls); (2) rapidly detect, control and extinguish fires that do occur thereby limiting damage (fire detection systems, automatic fire suppression, manual fire suppression, pre-fire plans); and (3) provide adequate level of fire protection for systems and structures so that a fire will not prevent essential safety functions from being performed (fire barriers, fire rated cable, success path remains free of fire damage, RAs). The licensee further stated that the use of epoxy floor coatings does not affect echelons 1, 2, and 3, and that the use of epoxy floor coatings does not directly result in additional fires starting or the compromising of automatic fire suppression functions, manual fire suppression functions, or post-fire SSD capability.

Based on its review of the information submitted by the licensee, and in accordance with 10 CFR 50.48(c)(2)(vii), the NRC staff concludes that the proposed PB method is an acceptable alternative to the corresponding NFPA 805, Section 3.3.3 requirement because it satisfies the performance goals, performance objectives, and performance criteria specified in NFPA 805 related to nuclear safety and radiological release, maintains safety margins, and maintains fire protection DID (fire prevention, fire detection, fire suppression, mitigation, and post-fire SSD capability).

3.1.4.2 NFPA 805, Section 3.3.5.1, Wiring Above Suspended Ceilings

In LAR Attachment L, Approval Request 2, the licensee identified issues regarding the cable jacket insulation for wiring above suspended ceilings in the Auxiliary Building office areas and the control room, including associated offices. The licensee stated that this wiring may be non-listed video/communication/data cables. The licensee further stated that current cable construction requirements for power and control cables are Institute of Electrical and Electronics Engineers (IEEE) 383 (Reference 96), qualified (or equivalent) or routed in metal conduit and that the original power and control cables may not have been IEEE-383 qualified or equivalent. The licensee further stated that where non-IEEE-383 qualified cables are used in cable trays, fire retardant coatings were applied in certain areas and field walkdowns and review of design drawings confirmed there are no power or control cables above the ceiling in the Auxiliary Building office areas (counting room and hot lab areas), but there are cable trays with power and control cables above the control room ceiling, and the power cables are 120 volts alternating current or 125 volts direct current. The licensee stated that the cable trays are either sprayed with a fire retardant coating (Flamemastic®) or are new trays with IEEE-383 qualified cables.

The NRC staff identified a conclusion made by the approval request as being different than the guidance provided in FAQ 06-0022, "Acceptable Electrical Cable Construction Tests"

(Reference 70). The licensee concluded that the test in NFPA 262, "Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces" (Reference 69), is equivalent to the IEEE-383 test. In FPE RAI 05 (Reference 22), the NRC staff requested that the licensee revise the request to eliminate reliance upon a perceived equivalency between NFPA 262 and IEEE-383. In its response to FPE RAI 05 (Reference 10), the licensee revised Approval Request 2 to not include a discussion regarding NFPA 262 as being equivalent to IEEE-383. The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee revised Approval Request 2 to be consistent with the guidance provided in FAQ 06-0022.

The licensee stated that the low voltage video/communication/data cables, which have been field routed above suspended ceilings, may not be plenum rated and that those cables sprayed with a flame-retardant coating do not pose a risk, as the combustible element of the cable jacketing has been nullified by the coating. The licensee stated that the basis for the approval request of this deviation is as follows:

- Low voltage is not susceptible to shorts causing a fire;
- Power and control cables are protected per this code section or sprayed with a flame-retardant coating; and
- By eliminating cables with the potential shorts, this eliminates ignition sources, and therefore, the jacketing of cable is not relevant.

The licensee stated that the location of wiring above suspended ceilings does not affect nuclear safety and that power and control cables comply, or comply with the intent of this section. The licensee further stated that other wiring, while it may not be in armored cable, in metallic conduit, coated in a flame-retardant material or plenum rated, is low voltage cable not susceptible to shorts that would result in a fire, and therefore, there is no impact on the NSPC.

The licensee stated that the location of cables above suspended ceilings has no impact on the radiological release performance criteria and the radiological review was performed based on the potential location of radiological concerns and is not dependent on the type of cables or locations of suspended ceilings. The licensee further stated that the cables do not change the results of the radiological release evaluation that concluded potentially contaminated water is contained and smoke is monitored and the cables do not add additional radiological materials to the area or challenge systems boundaries.

The licensee further stated that the proposed alternative maintains the safety margins of the analysis. The power and control cables meet the intent of this requirement and other wiring, while it may not be in armored cable, in metallic conduit, coated in a flame-retardant material, or plenum rated, is low voltage cable not susceptible to shorts that would result in a fire. The licensee further stated that these areas with video/communication/data cables have been analyzed in their current configuration and the inherent safety margin and conservatisms in the analysis remain unchanged, and therefore, the safety margin inherent and credited in the analyses will be preserved.

The licensee stated that the three echelons of DID described in NFPA 805, Section 1.2 are to (1) prevent fires from starting (combustible/hot work controls); (2) rapidly detect, control and extinguish fires that do occur thereby limiting damage (fire detection systems, automatic fire suppression, manual fire suppression, pre-fire plans); and (3) provide adequate level of fire protection for systems and structures so that a fire will not prevent essential safety functions from being performed (fire barriers, fire rated cable, success path remains free of fire damage, RAs). The licensee further stated that prior introduction of non-listed video/communication/data cables routed above suspended ceilings does not impact fire protection DID. The licensee further stated that echelon 1 is maintained by the cable installation procedures documenting the requirements of NFPA 805, Section 3.3.5.1 and that the introduction of cables above suspended ceilings does not affect echelons 2 and 3. The licensee further stated that video/communication/data cables routed above suspended ceilings does not directly result in compromising automatic fire suppression functions, manual fire suppression functions, or post-fire SSD capability.

Based on its review of the information submitted by the licensee, and in accordance with 10 CFR 50.48(c)(2)(vii), the NRC staff concludes that the proposed PB method is an acceptable alternative to the corresponding NFPA 805, Section 3.3.5.1 requirement because it satisfies the performance goals, performance objectives, and performance criteria specified in NFPA 805 related to nuclear safety and radiological release, maintains safety margins, and maintains fire protection DID (fire prevention, fire detection, fire suppression, mitigation, and post-fire SSD capability).

3.1.4.3 NFPA 805, Section 3.3.5.2, Metal Tray and Conduit

In LAR Attachment L, Approval Request 3, the licensee requested NRC staff review and approval of a PB method to demonstrate an equivalent level of fire protection for the requirement of NFPA 805, Section 3.3.5.2 regarding "only metal tray and metal conduits shall be used for electrical raceways." Specifically, the licensee requested approval of a PB method to justify the use of polyvinyl chloride (PVC) piping for underground embedded conduit permitted by a specification for electrical raceway installations, PVC, or HDPE type ducts (conduits), as permitted when embedded in compacted sand or reinforced concrete and PVC conduit in reinforced concrete walls.

The licensee stated that the basis for the approval request of this deviation is:

- The PVC/HDPE conduit, while a combustible material, is not subject to flame/heat impingement from an external source, which would result in structural failure, contribution to fire load, and damage to the circuits contained where the conduit is embedded in concrete or compacted sand; and

- Failure of circuits within the conduit resulting in a fire would not result in damage to external targets.

The licensee stated that the use of PVC/HDPE conduit in embedded locations does not affect nuclear safety, as the material in which conduits are run within an embedded location is not subject to the failure mechanisms potentially resultant in circuit damage or resultant damage to external targets, and therefore, there is no impact on the NSPC.

The licensee stated that the use of PVC/HDPE conduits in embedded installations has no impact on the radiological release performance criteria. The licensee stated that the radiological release review was performed based on the manual fire suppression activities in areas containing or potentially containing radioactive materials and is not dependent on the type of conduit material, that conduit material does not change the radiological release evaluation performed that concluded that potentially contaminated water is contained and smoke is monitored, and that conduits do not add additional radiological materials to the area or challenge systems boundaries, which contain such, as the PVC/HDPE conduits are embedded.

The licensee stated that the PVC/HDPE conduit material is embedded in a non-combustible configuration and that the material is protected when embedded from mechanical damage and from damage resulting from either an exposure fire or from a fire within the conduit impacting other targets. The licensee stated that the areas with PVC/HDPE conduit have been analyzed in their current configuration and the precautions and limitations on the use of these materials do not impact the analysis of the fire event and therefore, the inherent safety margin and conservatisms in these analysis methods remain unchanged.

The licensee stated that the three echelons of DID described in NFPA 805, Section 1.2 are to (1) prevent fires from starting (combustible/hot work controls); (2) rapidly detect, control and extinguish fires that do occur thereby limiting damage (fire detection systems, automatic fire suppression, manual fire suppression, pre-fire plans); and (3) provide adequate level of fire protection for systems and structures so that a fire will not prevent essential safety functions from being performed (fire barriers, fire rated cable, success path remains free of fire damage, RAs). The licensee stated that the use of PVC/HDPE conduits in embedded installations does not impact fire protection DID and that the PVC/HDPE conduit in embedded installations does not affect echelons 1, 2, and 3. The licensee further stated that PVC/HDPE conduits do not directly result in additional fires starting or the compromising of automatic fire suppression functions, manual fire suppression functions, or post-fire SSD capability.

Based on its review of the information submitted by the licensee, and in accordance with 10 CFR 50.48(c)(2)(vii), the NRC staff concludes that the proposed PB method is an acceptable alternative to the corresponding NFPA 805, Section 3.3.5.2 requirement because it satisfies the performance goals, performance objectives, and performance criteria specified in NFPA 805 related to nuclear safety and radiological release, maintains safety margins, and maintains fire protection DID (fire prevention, fire detection, fire suppression, mitigation, and post-fire SSD capability).

3.1.4.4 NFPA 805, Section 3.3.12(1), Reactor Coolant Pump Oil Collection

In LAR Attachment L, Approval Request 4, the licensee requested NRC staff review and approval of a PB method to demonstrate an equivalent level of fire protection for the requirement of NFPA 805, Section 3.3.12(1) regarding the oil collection system for each RCP.

The licensee stated that the oil collection system is designed and was reviewed in accordance with the current licensing basis (10 CFR Part 50, Appendix R, Section III.O) to collect leakage from credible pressurized and non-pressurized leakage sites in the RCP oil system. The licensee further stated that this may not include collection of oil mist, as the result of pump/motor operation and oil misting is not leakage due to equipment failure but inherent in the

operation of large open motors. The licensee further stated that it is normal for large motors to lose some oil through the seals and the oil to potentially become "atomized" by ventilation air flow. The licensee further stated that this atomized oil mist can then collect on surfaces in the vicinity of the RCP, as the pump design is not completely sealed to permit airflow for cooling, but oil mist resulting from normal operation will not adversely impact the ability of a plant to achieve and maintain SSD even if ignition occurred. The licensee stated that there are redundant RCPs, which are not required to achieve and maintain SSD.

The licensee stated that the basis for the approval request of this deviation is:

- The oil collection system is designed to collect leakage from credible pressurized and non-pressurized leakage sites in the RCP oil system;
- Oil misted from normal operation is not leakage; it is normal motor oil consumption;
- Oil misted from normal operation does not significantly reduce the oil inventory. The oil historically released as misting does not account for an appreciable HRR or accumulation near potential ignition sources or non-insulated reactor coolant piping;
- The RCPs use an oil of a high flash point, over 400 °F; and
- There are redundant RCPs, which are not essential to achieve or maintain fire SSD.

The licensee stated that the oil mist resultant from normal operations will not adversely impact nuclear safety, and there are redundant RCPs, which are not required to achieve or maintain post-fire SSD; therefore, there is no impact on the NSPC.

The licensee stated that the potential for oil mist from the RCPs has no impact on the radiological release performance criteria and the radiological release review was performed based on the manual fire suppression activities in areas containing or potentially containing radioactive materials. The licensee further stated that the entire Reactor Building in which the RCPs are located is an environmentally sealed radiological area and the oil mist does not add additional radiological materials to the area or challenge system boundaries.

The licensee stated that the oil mist resultant from normal operation will not adversely impact the ability of the plant to achieve and maintain post-fire SSD, even if ignition occurred. The licensee further stated that there are redundant RCPs, but that the RCPs are not required to achieve and maintain fire post-fire SSD. The licensee further stated that the reactor buildings have been analyzed in their current configuration, that precautions and limitations on potential oil misting do not impact the analysis of the fire event, and therefore, the inherent safety margin and conservatisms in these analysis methods remain unchanged.

The licensee stated that the three echelons of DID described in NFPA 805, Section 1.2 are to (1) prevent fires from starting (combustible/hot work controls); (2) rapidly detect, control and

extinguish fires that do occur thereby limiting damage (fire detection systems, automatic fire suppression, manual fire suppression, pre-fire plans); and (3) provide adequate level of fire protection for systems and structures so that a fire will not prevent essential safety functions from being performed (fire barriers, fire rated cable, success path remains free of fire damage, RAs). The licensee stated that the potential for oil mist from RCPs does not impact fire protection DID, echelon 1 is maintained by the oil collection system and RCP design, and the introduction of small amounts of oil misting does not affect echelons 2 and 3. The licensee further stated that the potential for oil mist from the RCPs does not directly result in additional fires starting or the compromising of automatic fire suppression functions, manual fire suppression functions, or post-fire SSD capability.

Based on its review of the information submitted by the licensee, and in accordance with 10 CFR 50.48(c)(2)(vii), the NRC staff concludes that the proposed PB method is an acceptable alternative to the corresponding NFPA 805, Section 3.3.12(1) requirement because it satisfies the performance goals, performance objectives, and performance criteria specified in NFPA 805 related to nuclear safety and radiological release, maintains safety margins, and maintains fire protection DID (fire prevention, fire detection, fire suppression, mitigation, and post-fire SSD capability).

3.1.4.5 NFPA 805, Fire Pump Separation and Diesel-Driven Fire Pump Protection

In LAR Attachment L, Approval Request 5, the licensee requested NRC staff review and approval of a PB method to demonstrate an equivalent level of fire protection for the requirements of NFPA 805, Section 3.5.5 regarding "each pump and its driver and controls shall be separated from the remaining fire pumps and from the rest of the plant by rated fire barriers," and NFPA 805, Section 3.9.4 regarding "diesel-driven fire pumps shall be protected by automatic sprinklers." The licensee stated that there are no rated fire barriers separating the electric and the diesel-driven fire pumps or respective controllers and the diesel-driven fire pump is not provided with automatic sprinkler protection.

The NRC staff also identified the need to separate fire pumps from the remainder of the plant. In FPE RAI 09 (Reference 22), the NRC staff requested that the licensee fully address the separation requirements of NFPA 805, Section 3.5.5, including fire pump separation from the remainder of the plant, and provide more detail regarding the separation of circuits for remote and automatic pump start. In its response to FPE RAI 09 (Reference 10), the licensee submitted a revised Approval Request 5, which is discussed below.

The licensee stated that the electric fire pump, diesel-driven fire pump, and associated controllers are located in the northeast corner of the protected area near the raw water tanks and water treatment area, and the diesel-driven fire pump is located in an enclosed structure for weather protection, while the electric fire pump is located outside. The licensee further stated that the electric fire pump is located approximately 50 feet to the west of the diesel-driven fire pump, the fire pump controllers are located outside and adjacent to the respective fire pumps, and the controllers are separated by more than 20 feet. The licensee further stated that this area of the yard has the raw water tanks, the jockey pumps between the two fire pumps, and miscellaneous other service water pumps to the west of the electric fire pump and that there are no significant intervening combustibles between the pumps/controllers. The licensee further

stated that these areas are a significant distance (greater than 100 feet) from the next nearest power block structure (i.e., the intake structure).

The licensee stated that cables for the electric fire pump run underground but are also exposed in several fire zones and that the cables and circuits for the diesel fire pump are self-contained at the pump, which automatically start on low system pressure. The licensee further stated that the diesel pump can be manually started at the pump controller and that there are no remote start circuits for this pump. The licensee further stated that no single fire could damage the cables for both pumps at the same time. The licensee concluded that there are no fire scenarios that can simultaneously damage the cables or circuits for both pumps.

The licensee stated that each fire pump is individually capable of providing the required demand capacity of the fire protection water system. The licensee further stated that the diesel-driven fire pump has a nominal 500 gallon fuel tank located outside but adjacent to the diesel-driven fire pump house, within a containment area in the event of a spill or rupture, and this tank provides over 8 hours of operational time. The licensee further stated that the electric fire pump is powered via the plant vital power system and can be powered by the EDG system.

The licensee stated that the basis for the approval request of this deviation is that:

- The diesel driven and electric fire pumps are spatially separated;
- There are no credible fire scenarios that would impact both fire pumps;
- Loss of one fire pump would not impact the ability to provide 100 percent of the required fire water demand. In addition, there are contingency plans for alternative fire water supply capability; and
- Reliable backup power supply is available to the electric fire pump in the event of a loss of offsite power and the diesel driven fire pump is impaired.

The licensee stated that the lack of fire rated separation between fire pumps and the lack of automatic suppression over the diesel-driven fire pump does not affect nuclear safety, as the fire pumps are not relied upon for nuclear safety functions. The licensee further stated that each fire pump individually has the ability to supply the required fire water and is not relied upon for other water requirements; therefore, there is no impact on the NSPC.

The licensee stated that the lack of fire rated separation between fire pumps and the lack of automatic suppression over the diesel-driven fire pump has no impact on the radiological release performance criteria. The licensee further stated that the radiological release review was performed based on the manual fire suppression activities in areas containing or potentially containing radioactive materials and is not dependent on the location of the fire pumps, that the location of the fire pumps does not change the radiological release evaluation performed, which concluded that potentially contaminated water is contained and smoke is monitored; and that the configuration of the fire pumps does not add additional radiological materials to the area or challenge systems boundaries.

The licensee stated that the lack of fire rated separation between fire pumps and the lack of automatic suppression over the diesel-driven fire pump does not negate the ability to supply the required fire water in a fire event. The licensee further stated that the nuclear safety analysis does not credit both of the fire pumps simultaneously or required suppression over the diesel fire pump, and that the use of these systems has been defined by the limitations of the analysis of the fire event, and therefore, the inherent safety margin and conservatisms in these analysis methods remain unchanged.

The licensee stated that the three echelons of DID described in NFPA 805, Section 1.2 are to (1) prevent fires from starting (combustible/hot work controls); (2) rapidly detect, control and extinguish fires that do occur thereby limiting damage (fire detection systems, automatic fire suppression, manual fire suppression, pre-fire plans); and (3) provide adequate level of fire protection for systems and structures so that a fire will not prevent essential safety functions from being performed (fire barriers, fire rated cable, success path remains free of fire damage, RAs). The licensee stated that echelon 3 is maintained by adequate separation of the fire pumps to ensure one fire pump is operable if a fire affects another pump and that the location of the fire pumps does not affect echelons 1 and 2. The licensee stated that the lack of fire rated separation between fire pumps and lack of automatic suppression over the diesel-driven fire pump does not directly result in additional fires starting or the compromising of automatic fire suppression functions, manual fire suppression functions, or post-fire SSD capability.

Based on its review of the information submitted by the licensee, and in accordance with 10 CFR 50.48(c)(2)(vii), the NRC staff concludes that the proposed PB method is an acceptable alternative to the corresponding NFPA 805, Sections 3.5.5 and 3.9.4 requirements because it satisfies the performance goals, performance objectives, and performance criteria specified in NFPA 805 related to nuclear safety and radiological release, maintains safety margins, and maintains fire protection DID (fire prevention, fire detection, fire suppression, mitigation, and post-fire SSD capability).

3.1.4.6 NFPA 805, Alarm Initiating Devices for System Actuation and System Alarm Annunciation

In LAR Attachment L, Approval Request 6, the licensee requested NRC staff review and approval of a PB method to demonstrate an equivalent level of fire protection for the requirements of NFPA 805, Section 3.8.1(2) regarding the alarm initiating devices, and NFPA 805, Section 3.9.3 regarding the fixed suppression actuation alarms being capable of alarming to constantly attended locations. Specifically, the licensee requested approval of a PB method to justify local alarms only for wet pipe sprinkler systems for the Turbine Buildings.

The licensee stated that the lack of an alarm in a constantly attended location does not prevent the suppression system from actuating and performing the design function to control a fire. The licensee further stated that actuation of a water-based suppression system would result in fire pump start and the fire pump start alarms in the control room, which is a constantly attended location. The licensee further stated that start of the fire pump without direct alarm indication would initiate an investigation as to the cause of the start and each suppression system has a local alarm and is located in the open areas of the Turbine Building where personnel nearby would hear the alarm and report it per station procedures.

The licensee stated that the basis for the approval request of this deviation is that:

- The suppression system will actuate and perform its design function to control the fire;
- A fire pump would start on low pressure in the fire main resulting in an alarm to the control room; and
- Either alarm via the fire pump or report via personnel hearing the local alarm would result in fire brigade response.

The licensee stated that the lack of automatic water-based suppression system alarms to a constantly attended location does not affect nuclear safety, as the suppression systems will actuate and perform the designed function to control the fire and therefore, there is no impact on the NSPC.

The licensee stated that the lack of automatic water-based suppression system alarms in a constantly attended location has no impact on the radiological release performance criteria. The licensee further stated that the radiological release review was performed based on the manual fire suppression activities in areas containing or potentially containing radioactive materials and is not dependent on the type of alarms on the suppression system. The licensee stated that the types of alarms on the suppression systems do not change the radiological release evaluation results that concluded potentially contaminated water is contained and smoke is monitored and the types of alarms on the suppression systems do not add additional radiological materials to the area or challenge systems boundaries.

The licensee stated that the lack of automatic water-based suppression system alarms in a constantly attended location does not negate the ability of the suppression system to actuate and perform the intended design function in a fire event. The licensee further stated that the use of these systems has been defined by the limitations of the analysis of the fire event, and therefore, the inherent safety margin and conservatisms in these analysis methods remain unchanged.

The licensee stated that the three echelons of DID described in NFPA 805, Section 1.2 are to (1) prevent fires from starting (combustible/hot work controls); (2) rapidly detect, control and extinguish fires that do occur thereby limiting damage (fire detection systems, automatic fire suppression, manual fire suppression, pre-fire plans); and (3) provide adequate level of fire protection for systems and structures so that a fire will not prevent essential safety functions from being performed (fire barriers, fire rated cable, success path remains free of fire damage, RAs). The licensee stated that the lack of automatic water-based suppression system alarms to a constantly attended location does not affect echelons 1, 2, and 3, and that the lack of alarms to a constantly attended location does not directly result in additional fires starting or the compromising of automatic fire suppression functions, manual fire suppression functions, or post-fire SSD capability.

Based on its review of the information submitted by the licensee, and in accordance with 10 CFR 50.48(c)(2)(vii), the NRC staff concludes that the proposed PB method is an acceptable alternative to the corresponding NFPA 805, Sections 3.8.1(2) and 3.9.3 requirements because it

satisfies the performance goals, performance objectives, and performance criteria specified in NFPA 805 related to nuclear safety and radiological release, maintains safety margins, and maintains fire protection DID (fire prevention, fire detection, fire suppression, mitigation, and post-fire SSD capability).

3.1.4.7 NFPA 805, Section 3.3.8, "Bulk Storage of Flammable and Combustible Liquids and NFPA 30"

In LAR Attachment L, Approval Request 7, the licensee requested NRC staff review and approval of a PB method to demonstrate an equivalent level of fire protection for the requirement of NFPA 805, Section 3.3.8 indicating that as a minimum, storage and use shall comply with NFPA 30, "Flammable and Combustible Liquids Code (1976)." This SE section discusses those sections for which the licensee is requesting NRC approval and includes an explanation of the issue and the basis for approval for each NFPA 30 requirement.

NFPA 30, Section 2-2.1.1, states:

> Every above-ground tank for the storage of Class II or Class IIIA liquids, except as provided in 2-2.1.2 and those liquids with boil-over characteristics and unstable liquids, operating at pressures not in excess of 2.5 pounds per square inch gauge (psig) and designed with a weak roof-to-shell seam or equipped with emergency venting which will not permit pressures to exceed 2.5 psig, shall be located in accordance with Table 2-1.

The licensee stated that NFPA 30 requires that tanks be 5 feet from the nearest building. The licensee stated that the diesel-driven fire pump fuel oil storage tank is located approximately 2 feet from the diesel-driven fire pump building and the fuel oil storage tank is located within a containment area capable of containing the entire contents of the tank. The licensee further stated that loss of the fuel oil storage tank would prohibit the use of the diesel-driven fire pump. The licensee further stated that the electric fire pump would be operational since the pumps are located approximately 50 feet apart, the controllers are separated by more than 20 feet, and therefore, it would not be affected by the loss of the diesel-driven fire pump. The licensee further stated that each pump individually is capable of providing the required water capacity and that this area is a significant distance from the nearest power block structure (i.e., the intake structure).

The licensee stated that the basis for the approval request is that:

- The only structure within 5 feet of the nearest building is the diesel-driven fire pump building;
- The fuel tank is dedicated to serve the diesel-driven fire pump;
- Loss of the diesel-driven fire pump fuel oil storage tank would result in loss of the diesel-driven fire pump; therefore, the location of the diesel-driven fire pump fuel oil storage tank adjacent to the diesel-driven fire pump building is not relevant; and

- The electric fire pump has the capacity to provide the required fire water supply in the event of loss of the diesel-driven fire pump.

NFPA 30, Section 2-2.4.2, states:

> Normal vents shall be sized either in accordance with: (1) the American Petroleum Institute Standard No. 2000, Venting Atmospheric and Low-Pressure Storage Tanks, 1973; or (2) other accepted standard; or (3) shall be at least as large as the filling or withdrawal connection, whichever is larger but in no case less than 1¼ inch nominal inside diameter.

The licensee stated that NFPA 30 states that the vent line should be equal to or greater than the largest filling or withdrawal connection, or sized per accepted standards. The licensee further stated that the diesel-driven fire pump fuel oil storage tank is equipped with a 1-1/2 inch vent line and a 2 inch fill line and that the tank was purchased and installed with the diesel-driven fire pump, but there is no record of a sizing calculation. The licensee further stated that the diesel-driven fire pump fuel oil storage tank has a capacity of approximately 500 gallons and that the tank is typically filled using the local fill connection small transfer pump and portable tank and the 2 inch direct fill line is not frequently used. The licensee stated that because of the small fill rate, rupture of the tank will not result and filling operations require personnel be present at the tank who stop the re-filling operation as necessary, thereby preventing overflow or damage to the tank.

The licensee stated the basis for the approval request is that the diesel-driven fire pump tank is a small volume tank that is refilled in accordance with station procedures that would not result in damage to the tank, and that the electric fire pump has the capacity to provide the required fire water supply in the event of loss of the diesel-driven fire pump.

NFPA 30, Section 2-4.4.3, states:

> Tanks for storage of Class I or Class II liquids inside of buildings shall be provided with either:
>
> (a) A normally closed remotely activated valve,
>
> (b) An automatic-closing heat-activated valve, or
>
> (c) Another approved device on each liquid transfer connection below the liquid level, except for connections used for emergency disposal, to provide for quick cut-off in the event of a fire in the vicinity of the tank. This function can be incorporated in the valve required in 2-4.4.2, and if a separate valve, shall be located adjacent to the valve required in 2-4.4.2.

The licensee stated that NFPA 30 states that tanks inside buildings with Class I or II liquids shall have a valve capable of quick cut-off in the event of a fire in the vicinity of the tank.

In FPE RAI 16 (Reference 25), the NRC staff requested that the licensee clarify a number of inconsistencies related to LAR Attachment L, Approval Request 7. Specifically, the NRC staff requested that the licensee clarify the fuel oil tanks being addressed and the applicable NFPA 30 requirements. In its response to FPE RAI 16 (Reference 15), the licensee stated that the 4A and 4B EDG Fuel Oil Storage Tanks are the correct tanks for this part of the Approval Request. The licensee further stated that these tanks are equipped with a cross-connect transfer line between the two storage tanks, which is provided with two normally closed shutoff valves. The licensee further stated that the other transfer connection below the liquid level is the discharge line from each Fuel Oil Storage Tank to the associated 4A or 4B EDG Fuel Oil Day Tank, located inside the associated EDG Room and this discharge line is equipped with one normally-open solenoid operated valve and multiple normally-open manually operated gate valves located in the associated (4A or 4B) Transfer Pump and EDG Rooms.

The licensee stated that the basis for the approval request is that:

- The 4A and 4B EDG Fuel Oil Storage Tanks are steel lined concrete tanks, and the potentially affected adjacent spaces in the Unit 4 EDG Building are separated from each other by 3-hour fire rated concrete barriers. A fire in one of these Unit 4 EDG Building rooms is not expected to impact the other Unit 4 EDG Building rooms, and therefore, at least one of the two EDG trains will remain available.

- At least one of the existing manual shutoff valves is expected to be available in the event of a fire, since manual shutoff valves are located in both the Transfer Pump Room and the EDG Room, and these rooms have independent ingress paths.

- The fire detection systems in the 4A/4B EDG Rooms and the 4A/4B EDG Fuel Transfer Rooms annunciate in the control room. Upon receipt of an alarm, an operator is dispatched to investigate the cause of the alarm.

The licensee further stated that the addition of another valve in order to meet NFPA 30 would not materially increase the level of safety, given the existing building design, system configuration, and protection features and conversely, adding another valve in the line theoretically introduces a potential failure point (e.g., unable to open the valve when needed) that could result in loss of fuel supply to support EDG extended operation.

NFPA 30, Section 2-5.2, states:

> When tanks are supported above the foundations, tank supports shall be installed on firm foundations. Supports for tanks storing Class I, Class II, or Class IIIA liquids shall be of concrete, masonry, or protected steel. Single wood timber supports (not cribbing) laid horizontally may be used for outside above-ground tanks if not more than 12 inches high at their lowest point.

The licensee stated that NFPA 30 states that when tanks are supported above the foundation, the supports shall be of concrete, masonry, or protected steel. The licensee further stated that the diesel-driven fire pump fuel oil storage tank is supported by unprotected steel legs. The

licensee further stated that the fuel oil storage tank is located within a containment area capable of containing the entire contents of the tank and fireproofing on the supports could prevent an exposure fire from causing structural failure of the supports and the fuel from the tank adding to the fire. The licensee further stated that the only exposure to the tank supports is from the tank itself, additional protection would not be of benefit, and loss of the fuel oil storage tank would prohibit the use of the diesel-driven fire pump. The licensee further stated that the electric fire pump would be operational, since the pumps are located approximately 50 feet apart, controllers are separated by more than 20 feet, and each pump individually is capable of providing the required water capacity.

The licensee stated that the basis for the approval request is that:

- The diesel-driven fire pump fuel oil storage tank is located within a containment area;

- There are no exposures to the tank other that itself; therefore, additional protection would not assure survival of the tank; and

- The electric fire pump has the capacity to provide the required fire water supply in the event of loss of the diesel-driven fire pump.

The licensee stated that there is no effect on nuclear safety because:

- The diesel-driven fire pump is not relied upon for nuclear safety functions. The electric fire pump, in the event of loss of the diesel-driven fire pump, has the ability to supply the required fire water and is not relied upon for other water requirements; and

- At least one Unit 4 EDG train will remain available due to the existing construction (i.e., 3 hour fire barriers), protection features (i.e., fire detection), and system configuration (i.e., shutoff valves located in multiple separated rooms).

The licensee concluded that there is no impact on the NSPC.

The licensee stated that there is no impact on the radiological release performance criteria. The licensee further stated that the radiological release review was performed based on the manual fire suppression activities in areas containing or potentially containing radioactive materials and is not dependent on the location of the fire pumps or the provision of a certain type of fuel shutoff valve in the EDG fuel systems. The licensee stated that the deviations from NFPA 30 do not change the radiological release evaluation results that concluded potentially contaminated water is contained and smoke is monitored and the deviations do not add additional radiological materials to the area or challenge systems boundaries.

The licensee stated that the issues regarding flammable and combustible liquid storage tanks do not negate either the ability to supply diesel fuel to at least one EDG train for extended operations, or the ability to supply the required fire water in a fire event. The licensee further

stated that the nuclear safety analysis does not credit both of the fire pumps simultaneously and that the use of these systems has been defined by the limitations of the analysis of the fire event, and therefore, the inherent safety margin and conservatisms in these analysis methods remain unchanged.

The licensee stated that the three echelons of DID described in NFPA 805, Section 1.2 are to (1) prevent fires from starting (combustible/hot work controls); (2) rapidly detect, control and extinguish fires that do occur thereby limiting damage (fire detection systems, automatic fire suppression, manual fire suppression, pre-fire plans); and (3) provide adequate level of fire protection for systems and structures so that a fire will not prevent essential safety functions from being performed (fire barriers, fire rated cable, success path remains free of fire damage, RAs). The licensee stated that echelon 3 is maintained by availability of the unaffected Unit 4 EDG train and the electric fire pump, which has the capacity to provide the required fire water supply in the event of loss of the diesel-driven fire pump. The licensee further stated that the deviations from NFPA 30 do not affect echelons 1 and 2, and the deviations do not directly result in additional fires starting or the compromising of automatic fire suppression functions, manual fire suppression functions, or post-fire SSD capability.

Based on its review of the information submitted by the licensee, and in accordance with 10 CFR 50.48(c)(2)(vii), the NRC staff concludes that the proposed PB method is an acceptable alternative to the corresponding NFPA 805, Section 3.3.8 requirement. This alternative satisfies the performance goals, performance objectives, and performance criteria specified in NFPA 805 related to nuclear safety and radiological release, maintains safety margins, and maintains fire protection DID (fire prevention, fire detection, fire suppression, mitigation, and post-fire SSD capability).

3.1.4.8 NFPA 805, Section 3.2.3(1), Inspection, Testing, and Maintenance

As discussed in SE Section 3.1.1.5, in FPE RAI 02.b (Reference 22), the NRC staff requested additional information from the licensee regarding the compliance strategy for NFPA 805, Chapter 3, Section 3.2.3(1). In its response to FPE RAI 02.b (Reference 10), the licensee submitted a new Approval Request 8 and requested NRC staff review and approval of a PB method to demonstrate an equivalent level of fire protection for the requirements regarding inspection, testing, and maintenance of credited fire protection systems and features. Specifically, the licensee requested approval to use PB methods to establish the appropriate inspection, testing, and maintenance frequencies for fire protection systems and features. Approval Request 8 is discussed below.

The licensee stated that PB inspection, testing, and maintenance frequencies would be established using the methods described in EPRI TR-1006756 (Reference 84).

The licensee stated that the use of this method for establishing inspection, testing, and maintenance frequencies will have no adverse impact on the ability to provide assurance that the availability and reliability of the fire protection systems and features are maintained to the levels assumed in the NFPA 805 engineering analyses.

The licensee stated that the scope and frequency of the inspection, testing, and maintenance activities for fire protection systems and features required in the FPP have been established

based on the previously approved TSs/License Controlled Documents and appropriate NFPA codes and standard. The licensee further stated that this request does not involve the use of the EPRI TR-1006756 to establish the scope of those activities that is determined by the required systems review identified in LAR Attachment C, Table C-2, "NFPA 805 Required Fire Protection Systems and Features," as supplemented.

The licensee stated that this request is specific to the use of EPRI TR-1006756 to establish the appropriate inspection, testing, and maintenance frequencies for fire protection systems and features credited by the FPP. The licensee further stated that as stated in EPRI TR-1006756, Section 10.1, "The goal of a performance-based surveillance program is to adjust test and inspection frequencies commensurate with equipment performance and desired reliability," and that this goal is consistent with the stated requirements of NFPA 805, Section 2.6, "Monitoring Program." The licensee further stated that EPRI TR-1006756 provides an accepted method to establish appropriate inspection, testing, and maintenance frequencies, which will ensure the required NFPA 805 availability, reliability, and performance goals are maintained.

The licensee stated that there will be no impact on the NFPA 805 NSP goals, performance objectives, and performance criteria because the use of PB test frequencies established per EPRI TR-1006756 methods, combined with NFPA 805, Section 2.6 will provide assurance that the availability and reliability of the fire protection systems and features are maintained to the levels assumed in the NFPA 805 engineering analyses and that this will ensure that there is no impact on the ability of the fire protection systems and features to perform their functions, and therefore, no impact on NSPC.

The licensee stated that the radiological release performance criteria are satisfied based on the determination of limiting radioactive release as described in LAR Attachment E, "NEI 04-02, Radioactive Release Transition." The licensee further stated that fire protection systems and features are credited as part of that evaluation and the use of PB test frequencies established per EPRI TR-1006756 methods combined with NFPA 805, Section 2.6 will ensure that the availability and reliability of the fire protection systems and features are maintained to the levels assumed in the NFPA 805 engineering analyses, which include those assumptions credited to meet the radioactive release performance criteria and therefore, there will be no adverse impact to radioactive release performance criteria.

The licensee stated that the proposed alternative maintains the safety margins of the analysis because it will provide assurance that the availability and reliability of the fire protection systems and features are maintained to the levels assumed in the NFPA 805 engineering analysis, which includes those assumptions credited in the FRE safety margin discussions. The licensee further stated that the use of these methods does not invalidate the inherent safety margins contained in the codes used for design and maintenance of fire protection systems and features, and therefore, the safety margin inherent and credited in the analysis will be preserved.

The licensee stated that the three echelons of DID described in NFPA 805, Section 1.2 are to (1) prevent fires from starting (combustible/hot work controls); (2) rapidly detect, control, and extinguish fires that do occur, thereby limiting damage (fire detection systems, automatic fire suppression, manual fire suppression, pre-fire plans); and (3) provide adequate level of fire protection for systems and structures so that a fire will not prevent essential safety functions from being performed (fire barriers, fire rated cable, success path remains free of fire damage,

RAs). The licensee stated that echelon 1 is not affected by the use of EPRI TR-1006756 methods and use of PB test frequencies established per EPRI TR-1006756 methods, combined with NFPA 805, Section 2.6, will provide assurance that the availability and reliability of the fire protection systems and features credited for fire protection DID are maintained to the levels assumed in the NFPA 805 engineering analyses, and therefore, there will be no adverse impact to echelons 2 and 3 of DID.

Based on its review of the information submitted by the licensee, and in accordance with 10 CFR 50.48(c)(2)(vii), the NRC staff concludes that the proposed PB method is an acceptable alternative to the corresponding NFPA 805, Section 3.2.3(1) requirement because it satisfies the performance goals, performance objectives, and performance criteria specified in NFPA 805 related to nuclear safety and radiological release, maintains safety margins, and maintains fire protection DID (fire prevention, fire detection, fire suppression, mitigation, and post-fire SSD capability).

3.2 Nuclear Safety Capability Assessment Methods

NFPA 805 is an RI/PB standard that allows engineering analyses to be used to show that FPP features and systems provide sufficient capability to meet the requirements of 10 CFR 50.48(c).

NFPA 805, Section 2.4, "Engineering Analyses," states:

> Engineering analysis is an acceptable means of evaluating a fire protection program against performance criteria. Engineering analyses shall be permitted to be qualitative or quantitative.... The effectiveness of the fire protection features shall be evaluated in relation to their ability to detect, control, suppress, and extinguish a fire and provide passive protection to achieve the performance criteria and not exceed the damage threshold defined in Section [2.5] for the plant area being analyzed.

Chapter 1 of the standard defines the goals, objectives, and performance criteria that the FPP must meet in order to be in accordance with NFPA 805.

NFPA 805, Section 1.3.1, "Nuclear Safety Goal," states:

> The nuclear safety goal is to provide reasonable assurance that a fire during any operational mode and plant configuration will not prevent the plant from achieving and maintaining the fuel in a safe and stable condition.

NFPA 805, Section 1.4.1, "Nuclear Safety Objectives," states:

> In the event of a fire during any operational mode and plant configuration, the plant shall be as follows:
>
> (1) *Reactivity Control.* Capable of rapidly achieving and maintaining subcritical conditions.

(2) *Fuel Cooling.* Capable of achieving and maintaining decay heat removal and inventory control functions.

(3) *Fission Product Boundary.* Capable of preventing fuel clad damage so that the primary containment boundary is not challenged.

NFPA 805, Section 1.5.1, "Nuclear Safety Performance Criteria," states:

Fire protection features shall be capable of providing reasonable assurance that, in the event of a fire, the plant is not placed in an unrecoverable condition. To demonstrate this, the following performance criteria shall be met.

(a) *Reactivity Control.* Reactivity control shall be capable of inserting negative reactivity to achieve and maintain subcritical conditions. Negative reactivity inserting shall occur rapidly enough such that fuel design limits are not exceeded.

(b) *Inventory and Pressure Control.* With fuel in the reactor vessel, head on and tensioned, inventory and pressure control shall be capable of controlling coolant level such that subcooling is maintained for a PWR and shall be capable of maintaining or rapidly restoring reactor water level above top of active fuel for a BWR such that fuel clad damage as a result of a fire is prevented.

(c) *Decay Heat Removal.* Decay heat removal shall be capable of removing sufficient heat from the reactor core or spent fuel such that fuel is maintained in a safe and stable condition.

(d) *Vital Auxiliaries.* Vital auxiliaries shall be capable of providing the necessary auxiliary support equipment and systems to assure that the systems required under (a), (b), (c), and (e) are capable of performing their required nuclear safety function.

(e) *Process Monitoring.* Process monitoring shall be capable of providing the necessary indication to assure the criteria addressed in (a) through (d) have been achieved and are being maintained

3.2.1 Compliance with NFPA 805 Nuclear Safety Capability Assessment Methods

NFPA 805, Section 2.4.2, "Nuclear Safety Capability Assessment," states:

The purpose of this section is to define the methodology for performing a nuclear safety capability assessment. The following steps shall be performed:

(1) Selection of systems and equipment and their interrelationships necessary to achieve the NSPC in Chapter 1

(2) Selection of cables necessary to achieve the NSPC in Chapter 1

(3) Identification of the location of nuclear safety equipment and cables

(4) Assessment of the ability to achieve the NSPC given a fire in each fire area

This SE section evaluates the first three of the topics listed above. SE Section 3.5 addresses the assessment of the fourth topic.

RG 1.205, Revision 1 (Reference 4), endorses NEI 04-02, Revision 2 (Reference 7), and Chapter 3 of NEI 00-01, Revision 2, (Reference 42), and promulgates the method outlined in NEI 04-02 for conducting an NSCA. This NRC-endorsed guidance (i.e., NEI 04-02, Table B-2, "NFPA 805, Chapter 2 – Nuclear Safety Transition – Methodology Review Worksheet" and NEI 00-01, Chapter 3) has been determined to address the related requirements of NFPA 805, Section 2.4.2. The NRC staff reviewed LAR Section 4.2.1, "Nuclear Safety Capability Assessment Methodology," and LAR Attachment B, NEI 04-02, Table B-2, "Nuclear Safety Capability Assessment – Methodology Review," against these guidelines.

The endorsed guidance provided in NEI 00-01, Revision 2 provides a framework to evaluate the impact of fires on the ability to maintain post-fire SSD. It provides detailed guidance for:

- Selecting systems and components required to meet the NSPC,
- Selecting the cables necessary to achieve the NSPC,
- Identifying the location of nuclear safety equipment and cables, and
- Appropriately conservative assumptions to be used in the performance of the NSCA.

The licensee developed the LAR based on the three guidance documents cited above. Although RG 1.205, Revision 1, endorses NEI 00-01, Revision 2, the licensee's review was performed to the guidance in NEI 00-01, Revision 1 (Reference 73), as discussed in LAR Section 4.2.1.1. To ensure that changes to the text in Chapter 3 did not alter the conclusions reached during the original review, the licensee performed a gap analysis against NEI 00-01, Revision 2. The licensee stated in LAR Section 4.2.1.1 that an additional review was performed per NEI 00-01, Revision 2, Chapter 3, for specific substantive changes in the guidance from NEI 00-01, Revision 1 that are applicable to an NFPA 805 transition. The results of this gap analysis are summarized by the three items as follows:

- Post-fire manual operation of rising stem valves in the fire area of concern (NEI 00-01, Section 3.2.1.2).

For this element, the licensee stated that the Recovery Action Feasibility Evaluation determined that in fire areas where operation of rising stem manual valves were used to achieve NSPC that fire damage in that area would not prevent the valve's operation because of separation (either by fire barrier or by distance) between the valve to be operated and the cables that failed a redundant shutdown path.

- Analysis of open circuits on high voltage (e.g., 4.16 kV) ammeter current transformers (NEI 00-01, Section 3.5.2.1).

For this element, the licensee stated that evaluation of current transformers in the power block determined that none of the plant's current transformers would result in secondary damage because of an open circuit.

- Analysis of control power for switchgear with respect to breaker coordination (NEI 00-01, Section 3.5.2.4).

For this element, the licensee stated that evaluation of plant switchgear requiring control power to provide overcurrent protection determined several instances where the potential for fire-induced loss of breaker coordination could occur. Where these instances occurred, either modifications (to protect cables or to prevent the cable damage from affecting the overcurrent trip of the circuit) are being performed to eliminate the concern, or an FRE determined that the risk of the fire-induced loss of breaker coordination is not significant.

As stated above, the licensee performed a gap analysis based on the review of the NSCA to the guidance of NEI 00-01, Revision 1 with respect to Revision 2 as endorsed by RG 1.205, Revision 1 and determined there were no impacts requiring inclusion in LAR Attachment B, Table B-2.

Based on the information provided in the licensee's submittal, as supplemented, the licensee used a systematic process to evaluate the post-fire SSA against the requirements of NFPA 805, Section 2.4.2, Subsections (1), (2), and (3), which meets the methodology outlined in NEI 00-01.

FAQ 07-0039, "Incorporation of Pilot Plant Lessons Learned – Table B-2" (Reference 74), provides one acceptable method for documenting the comparison of the SSA against the NFPA 805 requirements. This method first maps the existing SSA to the NEI 00-01, Chapter 3 methodology, which in turn is mapped to the NFPA 805, Section 2.4.2 requirements.

The licensee performed this evaluation by comparing its SSA against the NFPA 805 NSCA requirements using Chapter 3 of NEI 00-01, Revision 1, and documenting the results of the review in LAR Attachment B, Table B-2 in accordance with NEI 04-02, Revision 2.

The categories used to describe alignment with the NEI 00-01, Chapter 3 attributes are as follows:

1. The SSA directly aligns with the attribute: noted in LAR Attachment B, Table B-2, as "Aligns." (See discussion in SE Section 3.2.1.1.)

2. The SSA aligns with the intent of the attribute: noted in LAR Attachment B, Table B-2, as "Aligns with Intent." (See discussion in SE Section 3.2.1.2.)

Finally, some attributes may not be applicable to the SSA (e.g., the attribute may be applicable only to BWRs or PWRs). These are described in LAR Attachment B, Table B-2, as "Not Applicable."

As stated above, the licensee performed a review of the NSCA using the guidance of NEI 00-01, Revision 1, and conducted a gap analysis of changes in NEI 00-01, Revision 2. In LAR Section 4.2.1.1, the licensee stated that a gap analysis was performed. The licensee further stated in the gap analysis that based on its review against the guidance provided in NEI 00-01, Revision 2, there were no substantive changes that required modification to existing alignment, basis statements, or references. Based on the licensee's description of the gap analysis results and the statements in the LAR that no impacts were identified in the gap analysis to NEI 00-01, Revision 2, the NRC staff concludes the licensee reviewed its SSA against the methods endorsed in RG 1.205.

3.2.1.1 Attribute Alignment – Aligns

For the majority of the NEI 00-01, Chapter 3 attributes, the licensee determined that the SSA aligns directly with the attribute. In these instances, based on the validity of the licensee's statements, the NRC staff concludes that the licensee's statements of alignment are acceptable.

The following attributes identified in LAR Attachment B, Table B-2 as aligning via this method required additional review by the NRC staff:

3.2.1.2 Brazed Joints

NEI 00-01 attribute 3.2.1.2 states that exposure fire damage to manual valves and piping does not adversely impact their ability to perform their pressure boundary or SSD function except for heat sensitive piping materials, including tubing with brazed or soldered joints. The licensee indicated that brazed components were assumed not to fail as a result of a fire in this analysis. In a letter dated September 19, 2012 (Reference 9), the licensee stated that the "only instance in which fire damage to brazed tubing was excluded was for the atmospheric dump valve (ADV) controls. The ADV control is via digital controllers with current to pressure converters in the control room (Fire Area MM/106). These digital controllers are analyzed as part of the safe shutdown analysis." The licensee further stated that these digital controllers as part of the SSA are relied upon to convey signals routed in fire areas that are outside plant structures. The failure of copper tubing would result in the inability to open the ADV from the control room. Any action required to mitigate this is a longer term action required to cool down the plant. The licensee also stated that:

- The location of copper tubing is not within the zone of influence (ZOI) of any significant ignition sources. Therefore, the possibility of failed brazed joints is negligible.

- All above outdoor fire areas are transitioning as PB, and these areas are relatively low risk, further minimizing any potential effect of a failed brazed joint.

- The loss of ADV control capability, even when assumed to occur in all scenarios in these fire zones, has a minimal impact on the associated scenario risk and will not impact meeting the acceptance criteria in RG 1.174.

- Control of the ADVs is ensured independent of any potential fire impact on instrument air in the alternate shutdown fire areas.

- The only systems at Turkey Point that allow brazed copper pipes are the potable water and breathing air systems. One system that allows the replacement of galvanized piping with brazed copper piping is the service water system. None of these systems are required for SSD after a fire.

- The only other potential for brazed joints would be in air conditioning systems. Since these systems are failed on location and the brazed joints are local to these systems there is no impact on the analyses supporting NFPA 805.

For the above reasons, the licensee concluded that there is no significance to the use of the assumption that brazed connections will not fail due to the effects of a fire.

In SSD RAI 01 (Reference 22), the NRC staff requested that the licensee clarify LAR Attachment B, Table B-2, Section 3.2.1.2, regarding the compliance strategy for the assumption made on brazed joints. In its response to SSD RAI 01 (Reference 10), the licensee revised the alignment statement from "aligns with intent" to "aligns" and modified the alignment basis to indicate that, "There is no significance to the use of the assumption that brazed connections will not fail due to the effects of a fire. Therefore, the exclusion of the potential for an exposure fire to damage mechanical components at Turkey Point does not affect the ability of the plant to safely shutdown." The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee demonstrated that it follows the guidance of NEI 00-01, Section 3.2.1.2.

3.2.1.2 Attribute Alignment -- Aligns with Intent

In several of the NEI 00-01, Chapter 3 attributes, the licensee determined that the SSA aligns with the intent of the attribute and provided additional clarification when describing its means of alignment. The attributes identified in LAR Attachment B, Table B-2, as having this condition are as follows:

- 3.1.3.3, Define Combinations of Systems for Each Safe Shutdown Path

- 3.1.3.4, Assign Shutdown Paths to Each Combination of Systems

- 3.2.1.2, Fire Damage to Mechanical Components (not electrically supervised)

- 3.3.1.2, Cables Affecting Multiple Components

- 3.3.1.7, Circuit Coordination

- 3.3.3.1, Identify Circuits Required for the Operation of the Safe Shutdown Equipment

- 3.3.3.3, Assign Cables to the Safe Shutdown Equipment

- 3.5.1.2, Circuit Contacts and Operational Modes
- 3.5.1.5 [B], Cable Failure Modes
- 3.5.2.4, Circuit Failures Due to Inadequate Circuit Coordination
- 3.4.1.4, Manual Actions

In SSD RAI 17 (Reference 23), the NRC staff requested that the licensee provide a more detailed explanation of what specifically does not align with the guidance for LAR Attachment B, Table B-2, Sections 3.1.3.3, 3.1.3.4, 3.2.1.2, 3.3.1.2, 3.3.1.7, 3.3.3.1, 3.3.3.3, 3.5.1.2, 3.5.1.5, and 3.5.2.4. In its response to SSD RAI 17 (Reference 13), the licensee provided a detailed explanation of each attribute that "aligns with intent." The following is a summary of the licensee's responses for each of those NEI 00-01 sections:

- 3.1.3.3 and 3.1.3.4 - The licensee's methodology develops SSD logics to show the combinations of systems available. Path designations are not assigned to each possible combination of systems available to achieve SSD. Rather, a specific combination of systems capable of achieving each performance goal has been identified for each unit for each fire area. Within these credited systems are components and systems relied upon to perform the shutdown function and whose spurious operation could adversely affect that system's ability to achieve its SSD function. The NRC staff concludes that the methods as described by the licensee are acceptable because they are similar to the guidance provided in NEI 00-01, and therefore, align with the intent of NEI 00-01, which is to ensure that the post-fire SSA addresses the requirements of NFPA 805, Section 2.4.2.

- 3.2.1.2 - The licensee revised the alignment statement to "Aligns" and modified the alignment basis statement. This is further reviewed in this SE Section 3.2.1.1 as part of SSD RAI 01.

- 3.3.1.2 - The licensee's methodology does not explicitly direct analysts to consider and assign cables that can impact multiple components to all of those components. Though not explicitly stated, the intent of this guidance is followed by applying the methodology laid out in the SSD procedure. Because the methodology aligns without exception with Section 3.3.1.1 guidance, and as a result the circuit analysis performed, it meets the intent of the guidance in Section 3.3.1.2. The NRC staff concludes that the method as described by the licensee is acceptable because it is similar to the guidance provided in NEI 00-01, and therefore, aligns with the intent of NEI 00-01, which is to ensure that the post-fire SSA addresses the requirements of NFPA 805, Section 2.4.2.

- 3.3.1.7, 3.3.3.3, and 3.5.2.4 – The licensee stated that its circuit analysis procedure assumes coordination exists and that in the SER dated April 16, 1984 (Reference 34), the NRC staff stated (based on the FPL submittal) that because coordination of circuit protective devices was part of the original electrical system design, associated circuits by common power supply should not exist. The

licensee, however, further stated that this review was for the plant's alternate shutdown capability, and all power supplies being credited in the re-validation may not have been evaluated. The licensee further stated that it would perform modifications as necessary to achieve coordination on panels DP412A, 4DP86, and 4DP87 (only NSCA power supplies without demonstrated coordination) during the implementation phase. These items are listed in LAR Attachment S, Table S-2, as Items 19 and 20. The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee identified actions that will incorporate the provisions of NRC-endorsed guidance in the licensee's FPP and included the actions as modifications in LAR Attachment S, which would be required by the proposed license condition. The NRC staff also concludes that the methods as described by the licensee are acceptable because they are similar to the guidance provided in NEI 00-01, and therefore, align with the intent of NEI 00-01, which is to ensure that the post-fire SSA addresses the requirements of NFPA 805, Section 2.4.2.

In SSD RAI 07 (Reference 22), the NRC staff requested that the licensee provide additional information regarding breaker fuse coordination in common power supply and common enclosure in alignment with NEI 00-01, Sections 3.3.1.7, 3.5.2.4, and 3.5.2.5. In its response to SSD RAI 07 (Reference 10), the licensee identified three panels (DP412A, 4DP86, and 4DP87) as requiring resolution for common power supply issues. The licensee also identified certain breakers and resolutions for each breaker in Switchgears 3AA, 3AB, 3AD, 3AC, 4AA, 4AB, and 4AD. The licensee identified each of these outstanding work items in LAR Attachment S, Table S-2, as Modifications 1, 2, 5, 7, 8, 15, 17, and 18. The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee identified actions that will incorporate the provisions of NRC-endorsed guidance in the licensee's FPP and included the actions as modifications in LAR Attachment S, which would be required by the proposed license condition. The NRC staff also concludes that the methods as described by the licensee are acceptable because they are similar to the guidance provided in NEI 00-01, and therefore, align with the intent of NEI 00-01, which is to ensure that the post-fire SSA addresses the requirements of NFPA 805, Section 2.4.2.

- 3.3.3.1 - The licensee stated the guidance in NEI 00-01 is written such that if taken literally, single-line electrical diagrams, elementary wiring diagrams, electrical connection diagrams, and instrument loop diagrams, would be reviewed for every piece of SSD equipment. The licensee further stated that there are many pieces of SSD equipment that would not show up on an instrument loop diagram (e.g., motor operated valves (MOVs) that do not have an auto open/close signal) or even some of the other diagrams listed. The licensee further stated elementary wiring diagrams have block diagrams that provide all necessary cable information. The NRC staff concludes that the method as described by the licensee is acceptable because it is similar to the guidance provided in NEI 00-01, and therefore, aligns with the intent of NEI 00-01, which is to ensure that the post-fire SSA addresses the requirements of NFPA 805, Section 2.4.2.

- 3.5.1.2 - The licensee stated that the plant methodology meets all of the associated NEI guidance and provides direction to perform additional analysis beyond that in the NEI guidance to provide an additional level of assurance of the capability to safely shutdown. The licensee further stated that the additional guidance directs analysts to consider contacts in positions other than the normal position, if those contacts could reposition due to other than fire-induced causes (e.g., depressurization during operations to proceed to cold shutdown (CSD) will change the position of many reactor coolant system (RCS) pressure contacts that could affect spurious operation/maloperation of components). The licensee further stated that because these analyses considered contact positions other than the positions that would occur under normal operating conditions, the methodology did not "Align" with the NEI guidance, even though all analyses (without exception) at least consider the normal position of contacts and may consider other contact positions that could exacerbate the effects of the fire. The licensee further stated that for alternate shutdown areas, it performed circuit analysis which evaluated the effectiveness of the transfer switches (both in the normal and isolate positions) to isolate the circuit/restore operability of the component following the fire. The NRC staff concludes that the method as described by the licensee is acceptable because it is similar to the guidance provided in NEI 00-01, and therefore, aligns with the intent of NEI 00-01, which is to ensure that the post-fire SSA addresses the requirements of NFPA 805, Section 2.4.2.

- 3.5.1.5 [B] - The licensee determined that the methodology aligned with the intent of the guidance in NEI 00-01 rather than aligning with the explicit guidance because the methodology took a conservative approach on the guidance provided in [B] regarding potential for inter-cable shorting based on cable material, and [C] regarding number of concurrently damaged cables that must be assumed, rather than strictly following the guidance as written. The licensee stated that for the guidance provided in [B], it considered inter-cable shorting possible, even if the only cables in the fire area were thermoset cables and that for the guidance provided in [C], the number of inter-cable hot shorts that could occur in an area would not be limited. The licensee further stated that the inclusion of these potential failure modes can only make the results more conservative and thereby provide a greater assurance of the ability of the plant to safely shutdown. The NRC staff concludes that the method as described by the licensee is acceptable because it is similar to the guidance provided in NEI 00-01, and therefore, aligns with the intent of NEI 00-01, which is to ensure that the post-fire SSA addresses the requirements of NFPA 805, Section 2.4.2.

The remaining NEI 00-01 attribute 3.4.1.4, for which the licensee stated aligns with intent, described similar methods that were applied to achieve the intended result of the NEI 00-01 guidance. The NRC staff concludes that the risk significance evaluation of all manual actions required to support SSD, and the feasibility evaluation of all risk-significant manual actions as described by the licensee are acceptable because they are similar to the guidance provided in NEI 00-01, and therefore, align with the intent of NEI 00-01, which is to ensure that the post-fire SSA addresses the requirements of NFPA 805, Section 2.4.2.

3.2.1.3 Attribute Alignment -- Not in Alignment, but Prior NRC Approval

The licensee did not identify any attributes in this category.

3.2.1.4 Attribute Alignment -- Not in Alignment, but No Adverse Consequences

The licensee did not identify any attributes in this category.

3.2.1.5 Attribute Alignment -- Not in Alignment

The licensee did not identify any attributes in this category.

3.2.1.6 NFPA 805 Nuclear Safety Capability Assessment Methods Conclusion

The NRC staff reviewed the documentation provided by the licensee describing the process used to perform the NSCA required by NFPA 805, Section 2.4.2. The licensee performed this evaluation by comparing the SSA against the NFPA 805 NSCA methodology requirements using NEI 00-01, Revision 1 (Reference 73), and also conducted a gap analysis between Revision 1 and Revision 2 of NEI 00-01 to determine if any discrepancies existed. The licensee documented the results of its review in LAR Attachment B, Table B-2 in accordance with NEI 04-02, Revision 2 (Reference 7).

Based on the information provided in the licensee's submittal, as supplemented, the NRC staff accepts the method the licensee used to perform the NSCA with respect to the selection of systems and equipment, selection of cables, and identification of the location of nuclear safety equipment and cables, as required by NFPA 805, Section 2.4.2. The NRC staff accepts the licensee's method because it either:

- Met the NRC-endorsed guidance directly, or
- Met the intent of the endorsed guidance and adequate justification was provided.

3.2.2 Maintaining Fuel in a Safe and Stable Condition

The nuclear safety goals, objectives, and performance criteria of NFPA 805 allow more flexibility than the previous deterministic FPPs based on Appendix R to 10 CFR Part 50 and NUREG-0800, Section 9.5.1 (Reference 97), since NFPA 805 only requires the licensee to maintain the fuel in a safe and stable condition, rather than achieve and maintain CSD in 72 hours. In LAR Section 4.2.1.2, the licensee stated that the NFPA 805 licensing basis for a safe and stable condition in the event of a fire starting with the reactor in Modes 1, 2, or 3 is to maintain safe and stable conditions in Mode 3, with the ability to cool down and place the residual heat removal (RHR) system in service if necessary.

In SSD RAI 02 and PRA RAI 10 (Reference 22), the NRC staff requested that the licensee provide additional details on safe and stable condition. In its response to SSD RAI 02 and PRA RAI 10 (Reference 10), the licensee stated that:

- The final end state for safe and stable will be determined by the extent of equipment damage, existing inventory in the condensate storage tank (CST), and the ability to provide makeup to the condensate storage tank. If any of these conditions indicate it is advisable to place RHR system in service, then the plant will have the capability to do so. As a result, the equipment required to initiate and maintain hot shutdown [HSD] cooling, including the initiation of RHR cooling, remains part of the at power analysis.

- The plant may remain on RHR cooling at other than cold shutdown conditions for an extended period of time. The ability to maintain this condition for extended periods will require additional actions such as replenishment of diesel fuel oil. These actions are already part of the emergency response procedures. These are considered to be low risk (not adding to the total fire risk) because the actions are proceduralized and the time and resources are available to perform such actions.

- The actions to maintain safe and stable in Mode 3 with the plant being cooled by auxiliary feedwater (AFW) and a loss of instrument air is to rely on nitrogen backup bottles for the feedwater control valves. On loss of instrument air, the nitrogen backup is automatically aligned, but requires additional bottles to be valved in when the first set of bottles is exhausted (automatically aligned bottles will last approximately 2 hours). Additionally, the AFW control valves can be manually controlled locally. Both of these actions are modeled in the PRA, and the risk associated with these actions is explicitly calculated.

- In addition, for certain fire areas, this cooling will be accomplished by the standby steam generator feedwater pump. The actions required to put this pump in service and maintain its operation are modeled in the PRA. The limiting condition for decay heat removal using these methods is the availability of makeup water to either the CST (for AFW) or demineralized water storage tank (for standby steam generator feedwater pump). Without the ability of makeup, these tanks will last approximately 16 hours. While additional sources of water are expected to be available, they have not been credited in the fire analysis.

- Once on RHR cooling, the plant will be safe and stable at any temperature and pressure within the range of the RHR cooling system. The only actions required to maintain this condition are associated with the EDGs. The EDGs will require makeup to their lube oil system, and the fuel oil storage tanks will require refill. The lube oil requirement is at least 7 days and the oil is reserved for that use. The EDG fuel storage tanks will require refill in 7 days. Turkey Point maintains contracts to supply fuel oil to the site when required. These actions are proceduralized, and the risk is considered very low, based on the long time period involved and the ability to accomplish the actions.

- Should makeup be unavailable, a decision would be made to initiate RHR cooling. As stated above, RHR cooling remains part of the at power analysis. Therefore, the ability to proceed to RHR cooling and any associated variance

from deterministic requirements (VFDRs) is captured in the risk analysis. The risk is considered much lower than other quantified risks due to the proceduralized nature of the action and the long time required before the action is required.

- There are no time critical actions required to maintain safe and stable that are not part of the deterministic and PB analysis. Safe and stable is defined as Mode 3 with the ability to initiate RHR cooling if necessary. The decision to proceed with RHR cooling would be dependent on CST inventory. This action is required greater than 12 hours after the event and is not considered time critical. Additional long-term actions that are not modeled directly in the PRA are associated with EDG operation. The EDG will require additional lubrication oil and fuel oil. The lubricating oil will be required after 7 days, and fuel oil will be required after 7 days. These actions are not time critical and are part of the existing emergency plan.

- The FPRA HRA and the RA feasibility provide assurance that the actions can be accomplished. These analyses were done with just the minimum staffing with no requirements for off-shift personnel. The first action requiring off-site assistance would be refill of the EDG fuel oil tanks at 7 days. While the procedures and staffing requirements are adequate to achieve and maintain safe and stable conditions, any fire of such significance would trigger an emergency declaration of at least an Alert level. This would result in staffing the emergency response organization. In addition, it is also recognized that the event may last more than a single shift, and it is expected that a shift change could take place during such an event.

- The above responses show that the risk of the operator actions to achieve and maintain safe and stable conditions are either directly modeled in the PRA, providing a direct measure of risk, or the longer term actions are considered bounded by the short-term actions. All of the equipment required to maintain safe and stable conditions is part of the NSCA.

The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee demonstrated that the NSPC has the ability to maintain the nuclear fuel in a safe and stable condition in Mode 3, and also has the ability to proceed to RHR cooling, given the plant configuration and equipment availability following a fire.

In SSD RAI 19 (Reference 23), the NRC staff requested that the licensee provide additional information to clarify the decay heat performance goals identified for CSD. In response to SSD RAI 19 (Reference 13), the licensee stated that a CSD evaluation of the Decay Heat Removal Performance Goal is provided because there are two distinct methods analyzed by the plant to remove decay heat post-fire. The licensee stated that one of these methods is most often associated with providing decay heat removal when the plant is in a HSD state and the other when the plant is in a CSD state. The licensee further stated that it provided a CSD evaluation because neither the AFW nor the feedwater system use any components, material, or supporting systems (except for instrument air, if available, and low voltage power) that are in common with the RHR system and that because of this complete independence between the

two approaches to decay heat removal, and because both approaches may be required to satisfy the requirements for the Decay Heat Removal Performance Goal from NFPA 805, Section 1.5.1(c), it is appropriate to provide separate performance goals in LAR Attachment C, Table C-1 to address the approach used in each plant state. The licensee further stated that although the operators may use all of the systems mentioned above while the plant is in an HSD state per the TSs, the distinction of the systems identified in the performance goals as HSD or CSD was done based on:

- The plant states with which the systems are most commonly associated when in operation, and
- Not requiring time critical manual actions to ensure the ability to safely shutdown the plant.

The licensee further stated that all performance goals are inherently part of both HSD and CSD operations, and for the period during which decay heat removal transitions from one approach to another, there must be an overlap. The licensee further stated the Nuclear Safety Capability Fire Shutdown Analysis identifies all systems/safety functions that are required to be available to support HSD operations, which are also required to support CSD operations. The licensee further stated there are three additional safety functions that were determined to be required only prior to plant cooldown in preparation for CSD/RHR operations and that those safety functions are Decay Heat Removal, RCS Pressure Control, and Reactivity Control. The licensee further stated that Reactivity Control Safety Function consists of the systems and components necessary to ensure adequate RCS boration is established and this safety function is only necessary to offset positive reactivity inserted from xenon decay, which is only significant after many hours of being shutdown, or from cooling down the RCS. The licensee further stated that although the operator may use all of the systems mentioned above while the plant is in an HSD state per the TSs, the distinction of the systems identified in the performance goals as HSD or CSD was done based on the plant states that most closely related to when the systems would be required and to readily distinguish safety functions, which would not require time critical manual actions to ensure the ability to safely shutdown the plant. The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee's analysis encompassed the performance goals and safety functions for all plant conditions.

In SSD RAI 08 (Reference 22), the NRC staff requested that the licensee provide additional information regarding the failure scenarios, required position(s), SSA logic alternatives, and RA sequences for either closing or opening the Component Cooling Water (CCW) Thermal Barrier supply and return valves. In its response to SSD RAI 08 (Reference 11), the licensee identified failure scenarios, required SSD positions, SSA logic alternatives, and RAs for MOV-3/4-626 and MOV-3/4-716A in Fire Areas HH (Units 3 and 4 Cable Spreading Room (CSR)), CC (Units 3 and 4 Auxiliary Building North-South Breezeway), U (4160V Switchgear 4B), and V (4160V Switchgear 4A). The licensee further indicated that operations procedures would be revised as needed, and included those revisions in LAR Attachment S, Table S-3, Implementation Item 13. The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee provided proper documentation changes to reflect the results of the analysis and also identified a required action to revise operations procedures as needed and included that action as an implementation item in LAR Attachment S, which would be required by the proposed license condition.

On the basis of the licensee's analysis as described in the LAR, as supplemented, and as clarified in the RAI responses, the NRC staff concludes that the licensee provided reasonable assurance that the fuel can be maintained in a safe and stable condition, post-fire, for an extended period of time.

3.2.3 Applicability of Feed and Bleed

10 CFR 50.48(c)(2)(iii) limits the use of feed and bleed and states:

> In demonstrating compliance with the performance criteria of Sections 1.5.1(b) and (c), a high-pressure charging/injection pump coupled with the pressurizer power-operated relief valves (PORVs) as the sole fire-protected safe shutdown path for maintaining reactor coolant inventory, pressure control, and decay heat removal capability (i.e., feed-and-bleed) for pressurized-water reactors (PWRs) is not permitted.

The NRC staff reviewed LAR Table 5-3, "10 CFR 50.48(c) – Applicability/Compliance References," and LAR Attachment C, Table C-1, "NFPA 805 Ch 4 Compliance (NEI 04-02, Table B-3)," to evaluate whether the licensee meets the feed and bleed requirements. In LAR Table 5-3, the licensee stated that feed and bleed is not utilized as the sole fire protected SSD path for any scenario. The NRC staff confirmed this by reviewing the designated SSD path listed in LAR Attachment C for each fire area. The NRC staff review confirmed that all fire area analyses include the SSD equipment necessary to provide decay heat removal without relying on feed and bleed and that all fire areas either meet the deterministic requirements of NFPA 805, Section 4.2.3, or the PB evaluation performed in accordance with NFPA 805, Section 4.2.4, demonstrates that the integrated assessment of risk, DID, and safety margins for the fire area is acceptable. The NRC staff concludes that based on the information provided in LAR Table 5-3 as well as the fire area analyses documented in LAR Attachment C, the licensee meets the requirements of 10 CFR 50.48(c)(2)(iii) because feed and bleed is not utilized as the sole fire-protected SSD path.

3.2.4 Assessment of Multiple Spurious Operations

NFPA 805, Section 2.4.2.2.1, "Circuits Required in Nuclear Safety Functions" states, in part:

> Circuits required for the nuclear safety functions shall be identified. This includes circuits that are required for operation, that could prevent the operation, or that result in the maloperation of the equipment identified in 2.4.2.1 ["Nuclear Safety Capability Systems and Equipment Selection"]. This evaluation shall consider fire-induced failure modes such as hot shorts (external and internal), open circuits, and shorts to ground, to identify circuits that are required to support the proper operation of components required to achieve the nuclear safety performance criteria, including spurious operation and signals.

NFPA 805, Section 2.4.3.2 requires that the PSA evaluation addresses the risk contribution associated with all potentially risk-significant fire scenarios. Because the RI/PB approach taken used FREs in accordance with NFPA 805, Section 4.2.4.2, "Use of Fire Risk Evaluation,"

adequately identifying and including potential MSO combinations is required to ensure that all potentially risk-significant fire scenarios have been evaluated.

The NRC staff reviewed LAR Section 4.2.1.4, "Evaluation of Multiple Spurious Operations," and LAR Attachment F, "Fire-Induced Multiple Spurious Operations Resolution," to determine whether the licensee adequately addressed MSO concerns. As described in the LAR, as supplemented, the licensee's process for identification and evaluation of MSOs used an expert panel and followed the guidance of NEI 04-02 (Reference 7), RG 1.205 (Reference 4), and FAQ 07-0038 (Reference 72). The expert panel consisted of representatives from the licensee's fire protection and post-fire SSD, Operations/PRA, and supporting contract staff.

LAR Attachment F stated that the licensee conducted an initial expert panel review in 2008 and a second review in 2010 and that prior to initial review, the panel was provided with training and a specific project instruction for conducting the review. The expert panel sources for information and identifying MSOs included the SSA, generic lists (e.g., from Owners Groups), self-assessment results, and internal events PRA (IEPRA) insights. The NSCA and FPRA were updated to reflect the treatment of applicable MSO scenarios, which included the identification of equipment, cables, and cable routing by plant locations. The MSO combination components of concern were also evaluated as part of the NSCA. For cases where the pre-transition MSO combination components did not meet the deterministic compliance, the MSO combination components were added to the scope of the FREs.

LAR Attachment F describes the process the licensee utilized to address MSOs. That process includes 5 steps: (1) identify potential MSOs of concern, (2) conduct an expert panel to assess plant-specific vulnerabilities, (3) update the FPRA model and NSCA to include the MSOs of concern, (4) evaluate for NFPA 805 compliance, and (5) document results. As described in LAR Attachment F, under the results for Steps 3, 4, and 5, the MSOs identified in Steps 1 and 2 were incorporated in the FPRA model and evaluated for inclusion in the NSCA. For cases where the pre-transition MSO combination components did not meet the deterministic compliance, the licensee added MSO combination components to the scope of the FREs. Based on the evaluations, the licensee added components associated with the MSOs to the NSCA equipment list and logics, and performed cable tracing and circuit analysis. The FPRA quantified the fire-induced risk model containing the MSO pathways. The MSO contribution is included in the FPRA results, including those associated with VFDRs in the FREs.

In SSD RAI 12 (Reference 22), the NRC staff requested that the licensee provide additional information regarding the failure mode(s) for control circuits of valves/tanks used to control water supply to the charging pumps from the Volume Control Tank (VCT) or the Refueling Water Storage Tank. In its response to SSD RAI 12 (Reference 10), the licensee stated that it used the following analysis methodology for Fire Areas T/63 and U/67 to address the failure conditions:

- For Fire Area T/63 (Unit 3 Reactor Control Rod Equipment Room): Alternate suction source is established to the charging pump header using boric acid blender flow path. This alternate flow path is aligned by opening FCV-3-113A and FCV-3-113B, and by closing FCV-3-114B. Necessary components in this flow path are included in the analysis and remain available during a postulated fire in Fire Area T/63. This flow path provides enough RCS makeup for RCP seal

leakage and to maintain Pressurizer level during hot standby. Cold shutdown DID actions are performed to establish flow path from the refueling water storage tank (RWST) to the charging pump suction by isolating VCT and opening manual valve 3-358 to make-up for RCS coolant contraction during cool down. Multiple Charging Pumps (A and C) remain available following a fire in this area. Should one of these pumps be running at the time of a fire-induced spurious closure of the VCT isolation valve, the other pump would remain available if this spurious closure damaged the running pump.

- For Fire Area U/67 (4160V Switchgear 4B Room): Alternate suction source is established to the charging pump header using boric acid blender flow path. This alternate flow path is aligned by opening FCV-4-113A and FCV-4-113B, and by closing manual valve 4-360. Necessary components in this flow path are included in the analysis and remain available during a postulated fire in Fire Area U/67. This flow path provides enough RCS makeup for RCP seal leakage and to maintain Pressurizer level during hot standby. Cold shutdown DID actions are performed to establish flow path from the RWST to the charging pump suction by isolating VCT and opening manual valve 4-358 to make-up for RCS coolant contraction during cool down. Fire damage in this area can only affect the power supply of the VCT Isolation Valve (LCV-4-115C) and not its control circuit cables. Spurious closure of the normally open valve is not a concern in this area. The actions identified above are taken for a failure of the valve to close due to fire-induced loss of power to LCV-4-115C.

The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee demonstrated a protection methodology for the water supply to the charging pumps that prevents loss of pump suction.

In SSD RAI 18 (Reference 23), the NRC staff requested that the licensee provide further details regarding the evaluation of MSO. Specifically, the NRC staff requested that the licensee provide (a) the composition of the expert panel, (b) the criteria for resolution process used by the panel, (c) more detail regarding the limits and timing assumed between spurious actuations, and (d) justifications used for resolutions. In its response to SSD RAI 18 (Reference 13), the licensee stated:

a) The qualifications, background, and experience of the MSO expert panel members are judged to be sufficient and consistent with the guidance of FAQ 07-0038 (Reference 72). The expert panel individuals included specific experience in (by individual):

   - Turkey Point Systems/Operations/IEPRA;
   - Turkey Point Design Engineering, Fire Protection;
   - Safe Shutdown, Turkey Point Safe Shutdown Analysis, Circuit Analysis;
   - Turkey Point FPRA, System Engineering;

- Safe Shutdown, Circuit Analysis, NFPA 805 MSO Process;
- FPRA, System Engineering, NFPA 805 MSO Process;
- Turkey Point Safe Shutdown, Circuit Analysis; and
- Turkey Point FPRA, Safe Shutdown.

All but one member of the panel had over 20 years of NPP experience. The panel included individuals with degrees in Mathematics, Nuclear Engineering, Electrical Engineering, and Civil Engineering. The panel also included individuals who had participated in the development of the MSO resolution process for the industry, as well as participants in MSO expert panels for other plants.

b) As discussed in LAR Attachment F, consensus was achieved in the expert panel process by discussing individual scenarios, reaching a conclusion, and asking for any dissenting opinions. In addition, project action items were created when the panel members were unsure if additional research was needed.

c) The statement, "The proposed scenarios should not have presupposed limits on the number of fire-induced hot shorts or spurious operations," referred to in the RAI question was a discussion of the training conducted for the MSO expert panel. The intent of this discussion point was to not exclude scenarios during the expert panel meeting at the start because of likelihood only. This guidance was followed to ensure that a broad list of scenarios was identified for further refinement, as necessary, by the NSCA and FPRA. No restrictions were placed on the MSO expert panel regarding the sequential or simultaneous nature of circuit failures or the time between spurious actuations.

d) Example resolutions included:

- Scenario not applicable to plant (e.g., spurious operation of hot leg high point vent valves, which are not installed).
- Scenario precluded by component design/configuration such as pump runout, additional normally closed valves in the system, and non-high to low pressure interface MOV open and locked breaker(s) and closed valve(s).

The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee's expert panel process adopted a systematic and comprehensive process for identifying MSOs to be analyzed using available industry guidance.

In SSD RAI 16 (Reference 22), the NRC staff requested that the licensee provide additional information regarding the MSO resolution strategy, including a list of the resolution methods used to resolve potential NRC Information Notice (IN) 92-18 (Reference 98) valve failure

modes. In its response to SSD RAI 16 (Reference 10), the licensee stated that the NFPA 805 transition review of the design basis identified that the pressurizer PORV block valves, the RHR Suction from Emergency Core Cooling System Sump Isolation Valves, and the Auxiliary Feedwater Steam Admission Valves applied the "single spurious actuation" consideration in its resolution. The licensee further stated that the NFPA 805 transition evaluation was prepared to address the multiple spurious criteria and weak link analyses were performed to determine the maximum stall thrust of the installed MOV in the open and close directions. The licensee further stated that this was compared to the one time over-torque and over-thrust limits of the valve actuator and the over-thrust limits of the valve and that if the one time limits of the valve and actuator are not exceeded by the maximum stall thrust, it was assumed the valve body integrity is maintained and the MOV could subsequently be repositioned manually using its handwheel. The licensee further stated that in cases where actual operating experience exists where the MOV was subjected to being stroked open or closed without limit/torque switch protection, with no damage to the pressure boundary and valve disc connection, the operating experience was used to conclude that the valve integrity is maintained and the MOV could subsequently be repositioned manually using its handwheel.

The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee demonstrated a resolution strategy that resolves potential IN 92-18 valve failure modes for MSOs. The NRC staff concludes that the licensee's assessment of MSOs is acceptable because the licensee adopted a systematic and comprehensive process for identifying MSOs to be analyzed using available industry guidance and that process provides reasonable assurance that the FREs appropriately identify and include risk-significant MSO combinations.

3.2.5 Establishing Recovery Actions

NFPA 805, Section 1.6.52, "Recovery Action," defines an RA as:

> Activities to achieve the nuclear safety performance criteria that take place outside the main control room or outside the primary control station(s) for the equipment being operated, including the replacement or modification of components.

NFPA 805, Section 4.2.3.1 states:

> One success path of required cables and equipment to achieve and maintain the nuclear safety performance criteria without the use of recovery actions shall be protected by the requirements specified in either Sections 4.2.3.2, 4.2.3.3, or 4.2.3.4, as applicable. Use of recovery actions to demonstrate availability of a success path for the nuclear safety performance criteria automatically shall imply use of the performance-based approach as outlined in 4.2.4.

NFPA 805, Section 4.2.4, "Performance-Based Approach," states:

> When the use of recovery actions has resulted in the use of this approach, the additional risk presented by their use shall be evaluated.

The NRC staff reviewed LAR Section 4.2.1.3, "Establishing Recovery Actions," and LAR Attachment G, "Recovery Actions Transition," to evaluate whether the licensee meets the associated requirements for the use of RAs per NFPA 805.

The licensee stated in LAR Attachment G that, in accordance with the guidance provided in NEI 04-02 (Reference 7), FAQ 07-0030 (Reference 71), and RG 1.205 (Reference 4), the methodology used to determine RAs required for compliance consisted of:

> Step 1: Define the PCSs and determine which pre-transition operator manual actions (OMAs) are taken at PCS. The licensee identified two locations that are considered primary controls stations; the Alternate Shutdown Panel inside the respective unit's Train B Switchgear Room, and the transfer stations for the Train B Switchgear and Sequencer panels located inside the same room as the respective Alternate Shutdown Panel. Activities necessary to enable the primary control station(s) are identified in LAR Table G-1 as PCS activities. These activities do not require the treatment of additional risk.
>
> Step 2: Determine the population of RAs that are required to resolve VFDRs to meet the risk acceptance criteria (Risk) or maintain a sufficient level of DID. VFDRs are identified in LAR Attachment C, Table C-1, "NFPA 805 Ch 4 Compliance (NEI 04-02, Table B-3)." The final set of RAs is provided in LAR Table G-1, "Recovery Actions and Activities Occurring at the Primary Control Station(s)."
>
> Step 3: Evaluate the additional risk presented by the use of RAs required to demonstrate the availability of a success path. The set of RAs necessary to demonstrate the availability of a success path for the NSPC were evaluated for additional risk using the process described in NEI 04-02, FAQ 07-0030, Revision 5, and RG 1.205, and compared against the guidelines of RG 1.174 and RG 1.205. All of the RAs were reviewed for adverse impact. None of the RAs were found to have an adverse impact on the FPRA.
>
> Step 4: Evaluate the feasibility of the RAs. The RAs were evaluated against the feasibility criteria provided in NEI 04-02, FAQ 07-0030, Revision 5, and RG 1.205. Actions taken at the PCS are not classified as RAs, and their feasibility is evaluated in accordance with procedures for validation of off normal procedures. The licensee identified in LAR Attachment S, Table S-3, Implementation Item 13, update the post-fire shutdown procedures to reflect the updated NSCA and reduction in the scope of RAs, as well as update training processes to provide clarification on drills for RAs.
>
> Step 5: Evaluate the reliability of the RAs. The reliability of the specific RAs added to the FPRA is addressed in the FPRA Human Failure Evaluation Report. Review of RA reliability is addressed in SE Section 3.4.

OMAs meeting the definition of an RA are required to comply with the NFPA 805 requirements outlined above. Some of these OMAs may not be required to demonstrate the "availability of a success path," in accordance with NFPA 805, Section 4.2.3.1, but may still be required to be retained in the RI/PB FPP because of DID considerations described in NFPA 805, Section 1.2. Accordingly, the licensee identified these actions as "Recovery Action (DID)" in LAR

Attachment G, which are retained to maintain a sufficient level of DID. In each instance, the licensee determined whether a transitioning OMA was an RA, a DID-RA, or not necessary for the post-transition RI/PB FPP.

The licensee also stated that all credited RAs (including DID-RA), as listed in LAR Attachment G, were subjected to a feasibility review. In accordance with the NRC-endorsed guidance in NEI 04-02, the feasibility criteria in FAQ 07-0030 (Reference 71), were used to assess the RAs listed in LAR Attachment G, Table G-1, "Recovery Actions and Activities Occurring at the Primary Control Station(s)."

In SSD RAI 13 (Reference 22), the NRC staff requested that the licensee provide additional information regarding RAs for risk reduction, which requires operators to use alternate nitrogen bottles for AFW flow control valves (FCVs). In its response to SSD RAI 13 (Reference 11), the licensee indicated that instrument air and nitrogen are aligned to the AFW FCVs via check valves such that whichever is at a higher pressure provides the motive force to the FCVs. Without instrument air, nitrogen is required to modulate the FCVs. The licensee further stated that as long as there is a motive force, the FCVs can be remotely operated from the control room, meaning no constant operator presence is needed locally at the valves. The licensee further stated that the nitrogen backup stations are located on the 18-foot elevation of each unit's respective CST enclosure in the same area, but below the actual AFW FCVs, and that there are two stations for each unit (one per train), and each station contains five nitrogen bottles (three in-service and two in standby). The licensee further stated that at all times, three bottles at each station are valved in, so that upon loss of instrument air, nitrogen is automatically supplied to the AFW FCVs via check valves and that after swapping bottles, the procedure has operators replace the empty bottles. The licensee further stated that if operators are unable to supply enough nitrogen to the FCVs, operators will maintain steam generator levels by locally opening the FCV and using the local AFW flow and steam generator level indication. The licensee further stated that the recovery actions for alternative controls of AFW FCVs related to fire area CC is to manually operate AFW FCVs for Unit 3, and to valve in additional nitrogen bottles for Unit 4. The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee demonstrated that the RA can be completed using alternate nitrogen bottles to modulate the AFW FCVs, or by manually operating the AFW FCVs.

LAR Attachment G, Table G-1 describes each RA associated with the resolution of a VFDR from the fire area assessments as documented in LAR Attachment C, Table C-1, "NFPA 805 Ch 4 Compliance (NEI 04-02, Table B-3)." The licensee based its feasibility review on documentation only, including previous feasibility evaluations for SSD OMAs. The licensee included in LAR Attachment S, Table S-3, Implementation Item 13, to revise post-fire SSD procedures and training as necessary to incorporate updated NSCA strategies. The NRC staff concludes that the required action is acceptable because it will incorporate the NSCA strategies into post-fire shutdown procedures and training, and is included as an implementation item in LAR Attachment S, which would be required by the proposed license condition.

On the basis of the licensee's analysis as described in the LAR, as supplemented, and as clarified in the above RAI responses, the NRC staff concludes that the licensee followed the endorsed guidance of NEI 04-02 and RG 1.205 to identify and evaluate RAs in accordance with NFPA 805, and therefore, there is reasonable assurance of meeting the regulatory requirements of 10 CFR 50.48(c). The NRC staff also concludes that the feasibility criteria applied to RAs are

acceptable, subject to completion of LAR Attachment S, Table S-3, Implementation Item 13, which will incorporate the provisions of NFPA 805 in the FPP and would be required to be completed by the proposed license condition.

3.2.6 Plant-Specific Treatments or Technologies

3.2.6.1 Very Early Warning Fire Detection System

The licensee proposed to install Very Early Warning Fire Detection Systems (VEWFDS) (also referred to as "incipient detection") to monitor conditions, as well as provide indication and alarms inside key electrical cabinets during the incipient stage of a fire. Originally, LAR Attachment C, Table C-1, "NFPA 805 Ch 4 Compliance (NEI 04-02, Table B-3)," indicated that Fire Areas HH (CSRs), MM main control room (MCR), U (4160V Switchgear 4B Room), V (4160V Switchgear 4A Room), W (4160V Switchgear 3B Room), and X (4160V Switchgear 3A Room) will have modifications to install VEWFDS to meet risk criteria or for DID.

LAR Attachment S, Table S-2, Items 3, 4, and 25, identified the panels where the incipient detection system was to be installed.

In FPE RAI 01 and PRA RAI 01.r (Reference 22), the NRC staff requested that the licensee provide additional information regarding the design and installation details of the proposed installation of incipient detection systems. In its response to FPE RAI 01 (Reference 11), the licensee stated that the control room would have an incipient detection system installed in panels listed in LAR Attachment S, Table S-2, Items 3 and 4. However, in its response to PRA RAI 01.r (Reference 12), the licensee stated that credit for the incipient detection in the MCR has been eliminated. In its subsequent response to PRA RAI 01.r.02 (Reference 14), the licensee deleted LAR Attachment S, Table S-2, Items 3 and 4.

For VEWFDS installation, the licensee revised its configuration to specify in detail the design and functional features for the system to meet the requirements in FAQ 08-0046 (Reference 78), for the CSR electrical panels. Fire Area HH (Cable Spread Room) will have incipient detection systems installed to meet risk criteria and Fire Areas U, V, W, and X will have area-wide incipient detection systems installed for DID. The systems will be addressable. The level at which this occurs (specific cabinet or group of cabinets) is dependent on the vendor. Procedures will be developed through LAR Attachment S, Table S-3, Implementation Item 19, to localize the alarm to the cabinet/component level. The systems in the CSR are being credited to reduce risk contribution from the respective panels and provide risk benefits for CDF and LERF.

Additionally, LAR Attachment S, Table S-2, Item 32, identifies the fire areas where the area-wide incipient detection system will be installed. This system is installed for DID only and will be in addition to the existing early warning smoke detection system in the fire areas. The incipient detection system, as stated in the licensee's response to FPE RAI 01.d (Reference 11), will comply with the latest edition of NFPA 72 (Reference 66) and NFPA 76 (Reference 67) at the time of design initiation as well as the guidelines provided in FAQ 08-0046 (Reference 78). The licensee proposed an aspirating fire detection system that will be addressable and will alarm at the central fire detection system monitoring panel. Separate detection systems will be installed, one each for Fire Areas U (U4 4160V Switchgear 4B Room) and W (U3 4160V

Switchgear 3B Room). Also, new systems will be installed, one each for Fire Areas V (U4 4160V Switchgear 4A Room) and X (4160V Switchgear 3A Room). The design, installation and testing of the system will be in accordance with the guidelines of NFPA 76 and per applicable plant procedures and processes. Appropriate maintenance/surveillance procedures will be developed through LAR Attachment S, Table S-3, Implementation Item 17, in accordance with the guidelines of NFPA 76 and nuclear industry practices.

The licensee stated that guidelines as provided in NFPA 72, NFPA 76, and FAQ 08-0046, will be utilized in developing the post-implementation testing criteria and in the preparation of response procedures when Alert and Alarm signals are received.

The licensee stated that the panels in which the incipient detection system will be installed are identified in LAR Attachment S, Table S-2, Item 25, and that with the exception of communication panel C600, all panels are cabinets with metal walls on all four sides. The metal top has sealed cable entry penetrations, and the bottom is open for cable entry.

The licensee stated that the proposed incipient detection system will be per FAQ 08-0046 and will have the following design features:

- The system will be aspirating air sampling detector system consisting of an aspirating fire detector (AFD) unit and air sampling ports.
- The AFD unit will be addressable from a central fire detection system monitoring panel.
- The AFD unit will have multiple numbers of sample pipes [zones]. Each pipe [zone] will have multiple sampling ports. The quantity of the sample pipes and sample ports that can be processed by an AFD unit varies with different vendors.
- Each panel identified in LAR Attachment S, Table S-2, Items 25, will be installed with a sampling port.
- The number and location of the AFD units will be per the vendor's recommendations, plant configuration, and the guidelines of NFPA 76.
- The total number of sample ports served by an AFD unit will be per the vendor's recommendations and will comply with NFPA 76.

In its response to FPE RAI 01.e (Reference 11), the licensee stated that Alarm Response Procedures will be developed to guide the operator response to the alert and alarm signals originating from the incipient detection system. The licensee further stated that at the alert level signal, the operations and fire brigade procedures will provide guidance on:

- Identifying the panel or group of panels for the source of the signal;
- Identifying specific panels and specific sources within the panel. This activity will be performed by trained plant personnel using additional monitoring equipment

recommended by the vendor of the selected system. Such monitoring and assessment equipment may include a combination of portable AFD or infrared heat detectors;

- Initiating additional surveillances or fire watches as appropriate;
- Initiating fire brigade response if appropriate; and
- Panel-specific troubleshooting procedures that will provide guidance to assess the condition and to identify mitigation strategies. Technical support will assist in analyzing and assessing the condition. Guidance provided in NFPA 76 and FAQ 08-0046 will be utilized in developing procedures for panel specific mitigation actions.

The licensee further stated that at the alarm level signal, operations procedures will provide guidance on:

- Re-assessing the condition and identifying that the alarm is for the previously identified panel or from a different panel, and
- Initiating fire brigade response and station a fire watch as appropriate for the new condition.

The NRC staff concludes that the fire protection aspects related to the proposed installation of the VEWFDS are acceptable because:

- The installation of the VEWFDS will be performed in accordance with the appropriate NFPA codes and the equipment manufacturers' requirements.
- The VEWFDS will be properly tested during commissioning such that the alert and alarm triggers will be set to provide an appropriate level of sensitivity without unnecessary nuisance or spurious alarms.
- The design and configuration control process will control and maintain the setpoints for both alert and alarm functions of the VEWFDS.
- The VEWFDS equipment will be periodically tested and maintained in accordance with the NFPA 76 and appropriate nuclear standards requirements.
- First responders to VEWFDS indications will be trained in the use of fire extinguishers and instructed to suppress or control a fire that breaks out in the alarming cabinet.
- The licensee's procedure will require the first responders to identify, assess, and initiate brigade response until the degrading component is repaired, the cabinet is de-energized, or the alarm is satisfactorily reset.

In addition, the FPRA modeled the installation of the in-panel VEWFDS and took credit for its use in assessing the risk of various fire areas during certain scenarios. SE Section 3.4 addresses the technical review of the treatment of the VEWFDS in the FPRA, as well as the acceptability of the risk credit taken for the associated fire areas.

The licensee proposed the installation of a VEWFDS to monitor conditions in certain key electrical cabinets. Based on the information provided in the LAR, as supplemented, the NRC staff concludes that the fire protection aspects of the proposed VEWFDS installation are acceptable because the installation will be done in accordance with appropriate NFPA codes, and the guidance contained in FAQ 08-0046.

3.2.7 Conclusion for Section 3.2

The NRC staff reviewed the licensee's LAR, as supplemented, for conformity with the requirements contained in NFPA 805, Section 2.4.2 regarding the process used to perform the NSCA. The NRC staff concludes that the licensee's declared safe and stable condition is acceptable because the licensee's analysis process has adequately and appropriately identified and located the systems, equipment, and cables required to provide reasonable assurance of achieving and maintaining the fuel in a safe and stable condition, as well as meet the NFPA 805 NSPC.

In accordance with 10 CFR 50.48(c)(2)(iii), the NRC staff confirmed, through review of the documentation provided in the LAR, feed and bleed is not the sole fire-protected SSD path for maintaining reactor coolant inventory, pressure control, and decay heat removal capability.

The NRC staff also reviewed the licensee's process to identify and analyze MSOs. Based on the LAR, as supplemented, the NRC staff concludes that the process the licensee used to identify and analyze MSOs is comprehensive and thorough. Through the use of an expert panel process, in accordance with the guidance of RG 1.205, NEI 04-02, and FAQ 07-0038, potential MSO combinations were identified and included as necessary in the NSCA, as well as the applicable FREs. The NRC staff also concludes that the approach the licensee used for assessing the potential for MSO combinations is acceptable because the licensee performed it in accordance with NRC-endorsed guidance.

The NRC staff concludes that the process used by the licensee to review, categorize, and address RAs during the transition is consistent with the NRC-endorsed guidance contained in NEI 04-02 and RG 1.205, and therefore, the information provided by the licensee provides reasonable assurance that the regulatory requirements of 10 CFR 50.48(c) and NFPA 805 for NSCA methods are met.

3.3 Fire Modeling

NFPA 805 (Reference 3) allows both FM and FREs as PB alternatives to the deterministic approach outlined in the standard. These two PB approaches are described in NFPA 805, Sections 4.2.4.1 and 4.2.4.2, respectively. Although FM and FRE are presented as two different approaches for PB compliance, the FRE approach generally involves some degree of FM to support engineering analyses and fire scenario development. NFPA 805, Section 1.6.18

defines a fire model as a "mathematical prediction of fire growth, environmental conditions, and potential effects on SSCs, based on the conservation equations or empirical data."

The NRC staff reviewed LAR (Reference 8) Section 4.5.2, "Performance-Based Approaches," which describes how the licensee used FM as part of the transition to NFPA 805 at Turkey Point, and LAR Section 4.7.3, "Compliance with Quality Requirements in Section 2.7.3 of NFPA 805," which describes how the licensee performed FM calculations in compliance with the NFPA 805 PB evaluation quality requirements for fire protection systems and features, to determine whether the FM used to support transition to NFPA 805 is acceptable.

In LAR Section 4.5.2.1 the licensee stated that the FM approach, per NFPA 805, Section 4.2.4.1, was not used for the NFPA 805 transition. The licensee used the FRE PB method (i.e., FPRA) with input from FM analyses. Therefore, the NRC staff reviewed the technical adequacy of the FREs, including the supporting FM analyses, as documented in SE Section 3.4.2, to evaluate compliance with the NSPC.

The licensee did not propose any FM methods to support PB evaluations in accordance with NFPA 805, Section 4.2.4.1 as the sole means for demonstrating compliance with the NSPC. Therefore, the NRC staff concludes that there are no plant-specific FM methods acceptable for use to support compliance with NFPA 805, Section 4.2.4.1 for supporting the transition to NFPA 805.

3.4 Fire Risk Assessments

This section addresses the licensee's FRE PB method, which is based on NFPA 805, Section 4.2.4.2. The licensee chose to use only the FRE PB method in accordance with NFPA 805, Section 4.2.4.2. The FM PB method of NFPA 805, Section 4.2.4.1 was not used for this application.

NFPA 805, Section 4.2.4.2, "Use of Fire Risk Evaluations," states:

> Use of fire risk evaluation for the performance-based approach shall consist of an integrated assessment of the acceptability of risk, defense in depth [DID], and safety margins.
>
> The evaluation process shall compare the risk associated with implementation of the deterministic requirements with the proposed alternative. The difference in risk between the two approaches shall meet the risk acceptance criteria described in NFPA 805, Section 2.4.4.1, "Risk Acceptance Criteria." The fire risk shall be calculated using the approach described in NFPA 805, 2.4.3, ["Fire Risk Evaluations"].

3.4.1 Maintaining Defense-in-Depth and Safety Margins

NFPA 805, Section 4.2.4.2 requires that the "use of fire risk evaluation for the performance-based approach shall consist of an integrated assessment of the acceptability of risk, DID, and safety margins."

3.4.1.1 Defense-in-Depth

NFPA 805, Section 1.2, states:

> Protecting the safety of the public, the environment, and plant personnel from a plant fire and its potential effect on safe reactor operations is paramount to this standard. The fire protection standard shall be based on the concept of defense-in-depth. Defense-in-depth shall be achieved when an adequate balance of each of the following elements is provided:
>
> - Preventing fires from starting;
> - Detecting fires quickly and extinguishing those fires that do occur, thereby limiting fire damage; and
> - Providing an adequate level of fire protection for SSCs important to safety, so that a fire that is not promptly extinguished will not prevent essential plant safety functions from being performed.

The NRC staff reviewed LAR Section 4.5.2.2, "Fire Risk Approach"; LAR Section 4.8.1, "Results of the Fire Area Review"; and LAR Attachment C, "NEI 04-02, Table B-3 – Fire Area Transition"; as well as the associated supplemental information in order to determine whether the principles of DID were maintained in regard to the planned transition to NFPA 805 at Turkey Point.

The licensee summarized its methodology for evaluating DID in LAR Attachment L and provided additional detail in response to PRA RAI 09 (Reference 10). The licensee's method defines each of the three DID elements identified in NFPA 805, Section 1.2, as echelons 1, 2, and 3. In its response to PRA RAI 09, the licensee provided a table in which several features that provide defense for each of the three echelons are identified. The table included a discussion of the considerations used in assessing whether additional features should be added for each echelon. The DID assessment was performed for each fire area to determine whether changes would be needed to assure that each echelon has been satisfactorily achieved or whether additional features were needed and should be developed. Many of the identified fire protection features are already required to be in place in order to demonstrate compliance with the fundamental FPP and design elements of NFPA 805, Chapter 3 (e.g., combustible control program and hot work control program). However, the capabilities for some of the fire protection features for DID were improved based on the results of the PB analyses conducted during the NFPA 805 transition (e.g., detection system, suppression system, ERFBS, use of fire rated cable, and use of RAs).

Based on the NRC staff's review of the LAR, the NRC staff's review of the FREs during the audit (Reference 99), and the licensee's response to PRA RAI 09, the NRC staff concludes that the licensee systematically and comprehensively evaluated fire hazards, area configurations, detection and suppression features, and administrative controls in each fire area, and that the methodology as proposed in the LAR, adequately evaluates DID against fires as required by NFPA 805. Therefore, the proposed RI/PB FPP adequately maintains DID.

3.4.1.2 Safety Margins

NFPA 805, Section 2.4.4.3 states:

> The plant change evaluation shall ensure that sufficient safety margins are maintained.

NEI 04-02, Section 5.3.5.3, "Safety Margins," lists two specific criteria that should be addressed when considering the impact of plant changes on safety margins:

- Codes and standards or their alternatives accepted for use by the NRC are met; and

- Safety analyses acceptance criteria in the licensing basis (e.g., FSAR, supporting analyses, etc.) are met, or the change provides sufficient margin to account for analysis and data uncertainty.

LAR Section 4.5.2.2, "Fire Risk Approach," discusses how safety margins are addressed as part of the FRE process and that this process is based on the requirements of NFPA 805, industry guidance in NEI 04-02 (Reference 7), and RG 1.205 (Reference 4). An FRE was performed for each fire area containing VFDRs. The FREs contain the details of the licensee's review of safety margins for each PB fire area. The results of the licensee's safety margin assessment by fire area are provided in LAR Attachment C, Table B-3.

LAR Section 4.5.1.2 states that the FPRA applies methodologies consistent with the guidance in NUREG/CR-6850 (References 50 – 52), and according to LAR Attachment H, NRC-approved FAQs. LAR Attachment J explains that FM, including V&V, performed in support of the FPRA utilized accepted codes and standards including NUREG/CR-6850, NUREG-1805 (Reference 56), NUREG-1824 (Reference 57), etc. In its response to PRA RAI 09 (Reference 10), the licensee further described the methodology used to evaluate safety margins in the FREs to include the following evaluations and determinations:

- FM: The results of the FM used in support of the FRE (i.e., as part of the FPRA) were documented as part of the qualitative safety margin review performed consistent with guidance in NEI 04-02, Section 5.3.5.3.

- Plant System Performance: The safety margin inherent in the analyses for the plant design basis events was preserved in the analysis for fire events and satisfied the requirements in NEI 04-02, Section 5.3.5.3.

The NRC staff concludes that the safety margin criteria described in NEI 04-02, Section 5.3.5.3 and the LAR, as supplemented, are consistent with the criteria as described in RG 1.174 (Reference 43), and therefore, acceptable. The NRC staff concludes that the licensee used appropriate codes and standards (or NRC guidance), and met the safety analyses acceptance criteria in the licensing basis. Based on the NRC staff's review of the LAR and the FREs during the audit (Reference 99), the NRC staff concludes that the licensee's approach addressed the issue of safety margins in the implementation of the FRE process.

3.4.2. Quality of the Fire Probabilistic Risk Assessment

The objective of the PRA quality review is to determine whether the plant-specific PRA used in evaluating the proposed LAR is of sufficient scope, level of detail, and technical adequacy for the application. The NRC staff evaluated the PRA quality information provided by the licensee in its NFPA 805 submittal, as supplemented, including industry peer review results and self-assessments performed by the licensee. The NRC staff reviewed LAR Section 4.5.1, "Fire PRA Development and Assessment"; LAR Section 4.7, "Program Documentation, Configuration Control, and Quality Assurance"; LAR Attachment C, "NEI 04-02, Table B-3 – Fire Area Transition"; LAR Attachment U, "Internal Events PRA Quality"; LAR Attachment V, "Fire PRA Quality"; and LAR Attachment W, "Fire PRA Insights"; as well as associated supplemental information.

The licensee developed its IEPRA during the individual plant examination process and continued to maintain and improve the PRA as RG 1.200, and supporting industry standards have evolved. The licensee developed its FPRA model for both Level 1 (core damage) and partial Level 2 (large early release) PRA during at-power conditions. For the development of the FPRA, the licensee modified its IEPRA model to capture the effects of fire.

In LAR Section 4.8.2, the licensee stated that no plant changes (beyond those identified and scheduled to be implemented as part of the transition to an FPP based on NFPA 805) are outstanding with respect to their inclusion in the FPRA model.

3.4.2.1 Internal Events PRA Model

The licensee's evaluation of the technical adequacy of the portions of its IEPRA model used to support development of the FPRA model included a combination of peer reviews and gap assessments. A full scope peer review was performed for the IEPRA in 2002 by the Westinghouse Owners Group (WOG) using NEI 00-02 (Reference 100), which pre-dated the ASME/ANS PRA standard and RG 1.200. A focused-scope peer review of the HRA and internal flood technical elements was performed in 2011 using the NEI 05-04 (Reference 101), process, and the combined PRA standard, ASME/ANS-RA-Sa-2009 (Reference 45), as clarified by RG 1.200, Revision 2. A gap assessment was also performed as discussed in the licensee's response to PRA RAI 22.01 (Reference 14). The assessment used the NEI 00-02, "Probabilistic Risk Assessment Peer Review Process Guidance," self-assessment process (Reference 100), (Reference 102), and (Reference 103), as supplemented by clarifications and qualifications contained in Appendix B to RG 1.200, Revision 2. The IEPRA model that was reviewed for the gap assessment serves as the basis of the FPRA used in performing PRA evaluations for the LAR.

For many supporting requirements (SRs), there are three degrees of "satisfaction" referred to as Capability Categories (CCs) (i.e., CC-I, CC-II, and CC-III), with CC-I being the minimum; CC-II considered widely acceptable; and CC-III indicating the maximum achievable scope/level of detail, plant specificity, and realism. For other SRs, the CCs may be combined (e.g., the requirement for meeting CC-I may be combined with CC-II), or the requirement may be the same across all CCs so that the requirement is simply met or not met. For each SR, the peer review team designates one of the CCs or indicates that the SR is met or not met. In general, a

fact and observation (F&O) is written for any SR that does not fully satisfy the associated CC-II requirements of the combined ASME PRA standard.

LAR Table U-1 provides the licensee's resolutions of all but two of the F&Os from the 2002 WOG peer review and the 2011 focused scope peer review. In its response to PRA RAI 27.a (Reference 11), the licensee provided resolutions to the two remaining F&Os, HR-3 and IE-2, from the 2002 WOG peer review. In its response to PRA RAI 22.01 (Reference 14), the licensee provided the F&Os from the gap assessment. The licensee resolved each F&O by assessing the impact of the F&Os on the FPRA and the results for the NFPA 805 application. The NRC staff's review and conclusions for the licensee's resolution of each F&O are summarized in the NRC's Record of Review dated February 23, 2015 (Reference 104).

As a result of the review of the LAR and responses to PRA RAIs, the NRC staff concludes that the IEPRA is adequate and can be used to support the FPRA. To reach this conclusion, the NRC staff reviewed all F&Os provided by the peer reviewers, as well as the results of the gap assessment provided by the licensee, and determined that the resolution of every F&O and gap supports the determination that the quantitative results are adequate or have no significant impact on the FPRA. The NRC staff also concludes that the licensee demonstrated that the IEPRA meets the guidance in RG 1.200, Revision 2; it was reviewed against the applicable SRs in ASME/ANS-RA-Sa 2009; and it is technically adequate to support the FREs and other risk calculations required for the NFPA 805 application.

3.4.2.2 Fire PRA Model

The licensee evaluated the technical adequacy of the FPRA model by conducting a peer review using the NEI 07-12 process (Reference 105), and the FPRA part (Part 4) of ASME/ANS-RA-Sa-2009, as clarified by RG 1.200, Revision 2, and a follow-on focus-scoped peer review to address the FSS, HRA, and PRM technical elements. The full-scope peer review of the FPRA was performed in February 2010, and the follow-on focused scope peer review was performed in March 2012.

LAR Attachment V, Table V-3, as supplemented, provides the licensee's resolutions to all F&Os written against SRs of Part 4 of the ASME/ANS RA-Sa-2009 PRA standard as clarified by RG 1.200, Revision 2, sixty of which are findings and one of which is considered an unreviewed analysis method (UAM) per the peer review guidelines (Reference 105). LAR Attachment V, Table V-1, as supplemented by the licensee's response to PRA RAI 02 (Reference 10), provides the results of the peer review CC assessment for each SR. LAR Attachment V, Table V-2, as supplemented by the licensee's response to PRA RAI 02, identifies all SRs that were determined by the peer review to be not met or only met at CC-I and provides an evaluation of those SRs.

As described in LAR Attachment V, the licensee resolved each F&O by assessing the impact of the F&O on the FPRA and on the results for the LAR. The NRC staff evaluated each F&O and the licensee's respective resolution in LAR Attachment V to determine whether the issue had any significant impact on the LAR. The NRC staff's review and conclusions for the resolution of each F&O is summarized in the NRC's Record of Review dated March 23, 2015 (Reference 104). The NRC staff requested that the licensee provide additional information regarding several issues that are discussed below.

In PRA RAI 01.a (Reference 22), the NRC staff informed the licensee that its calculation of hot work and transient fire frequencies differed from the guidance provided in NUREG/CR-6850. In its response to PRA RAIs 01.a (Reference 12), and PRA RAI 01.a.01 (Reference 14), the licensee stated that the hot work and transient fire frequency analysis would be updated to consider the guidance provided in FAQ 12-0064 (Reference 106). In its response to PRA RAI 29.a (Reference 14), the licensee also stated that it will apply the guidance in FAQ 12-0064 to update the PRA and the updated transition change-in-risk estimates will use the updated PRA. The NRC staff finds this issue to be resolved because the PRA has been updated and the transition change-in-risk estimates, submitted by the licensee on September 12, 2014 (Reference 17), include the updated hot work and transient frequency analysis and are consistent with the guidance in FAQ 12-0064.

In its response to PRA RAI 01.j.01 (Reference 14), the licensee clarified that it performed the statistical propagation of parametric uncertainty and addressed correlation of fire-specific parameters, including ignition frequencies, non-suppression probabilities, severity factors, and circuit failure probabilities. Although the licensee indicated in its letter dated July 18, 2014 (Reference 16), that risk results provided for the integrated analysis represent point estimates, the licensee explained that the corresponding mean values are no more than 1 percent higher than the point estimates. The NRC staff finds this issue to be resolved because the transition change-in-risk estimates, submitted by the licensee on September 12, 2014 (Reference 17), are within 1 percent of the corresponding mean values. Additionally, the licensee clarified in its response to PRA RAI 01.j.01.01 (Reference 16) that post-transition, the statistical propagation of parametric uncertainty, including consideration of the state of knowledge correlation, will be reviewed to verify that mean risks values remain consistent with the point estimates.

In its response to PRA RAI 01.l (Reference 12), the licensee provided a summary of a method to evaluate HEPs that were described as similar to the screening/scoping methods of NUREG-1921 (Reference 60). However, in PRA RAI 01.l.01 (Reference 24), the NRC staff informed the licensee of numerous differences between the licensee's method and those in NUREG-1921. In its response to PRA RAI 01.l.01 (Reference 14), the licensee stated that the FPRA HRA would be updated to employ methods consistent with the guidance in NUREG-1921. The licensee further clarified in its response to PRA RAI 29.a (Reference 14) that all HEPs would be quantified in detail using the HRA calculator. In its response to PRA RAI 29 (Reference 14) and (Reference 17), the licensee discussed applied HEPs developed using guidance in NUREG-1921 and the HRA calculator to the integrated analysis. The licensee provided a supplement to LAR Attachment W reflecting this change in the baseline FPRA that will be used for self-approval. The NRC staff finds this issue to be resolved because the transition change-in-risk estimates, submitted by the licensee on September 12, 2014 (Reference 17), employ HEPs consistent with the guidance in NUREG-1921.

In PRA RAI 01.m.01 (Reference 24), the NRC staff notified the licensee that the FPRA HRA assumes complete dependency amongst screening/scoping HEPs and that while this treatment is conservative for the post-transition plant configuration, it may produce non-conservative results for CDF and LERF when applied to the compliant plant configuration. In PRA RAI 01.m.02 (Reference 24), the NRC staff requested the licensee to provide clarification regarding its treatment of dependencies that may exist between fire response actions and those HFEs carried over from the IEPRA. In its response to the PRA RAI 01.m.01 and PRA

RAI 01.m.02 (Reference 14), the licensee stated that the FPRA HRA and dependency analysis would be revised to incorporate the methodology defined in NUREG-1921. In its response to PRA RAI 29.a (Reference 14), the licensee stated that all HEPs would be quantified in detail using the HRA calculator. In its response to PRA RAI 29 (Reference 14) and (Reference 17), the licensee incorporated these revisions into the integrated analysis and provided a supplement to LAR Attachment W reflecting this change in the baseline FPRA that will be used for self-approval. The NRC staff finds this issue to be resolved because the transition change-in-risk estimates, submitted by the licensee on September 12, 2014 (Reference 17), included HFEs whose HEPs and dependencies were evaluated and found to be consistent with the guidance in NUREG-1921.

In PRA RAI 01.k (Reference 22), the NRC staff requested additional information associated with the establishment of acceptable minimum (or "floor") values for HEP combinations (Reference 22). In its response to PRA RAI 01.k (Reference 12), the licensee provided a sensitivity study applying a floor value of 1.0E-05 to all HEP combinations in the FPRA model. Furthermore, in its response to PRA RAI 29.a (Reference 14), related to PRA RAI 01.k, the licensee stated that it will provide adequate justification for any value less than 1.0E-05, consistent with the guidance in NUREG-1921. In its response to PRA RAI 29.c.i (Reference 17), the licensee stated it applies a joint HEP floor value of 1.0E-05 in the updated PRA. The NRC staff finds this issue to be resolved because the PRA has been updated using acceptable minimum floor values. Any future reduction below these values will be justified consistent with accepted guidance, and the transition change-in-risk estimates submitted by the licensee on September 12, 2014 (Reference 17), include acceptable minimum floor values.

In PRA RAI 01.o (Reference 22), the NRC staff requested that the licensee provide justification for the CDF criteria used to screen multi-compartment analysis (MCA) scenarios from FPRA quantification and for the barrier failure probabilities. In its response to PRA RAI 01.o (Reference 12), the licensee stated it removed the CDF screening criteria and quantified all previously screened MCA scenarios. In its response to PRA RAIs 01.e (Reference 11) and 01.o (Reference 12), the licensee clarified that unless otherwise verified to have a fire damper or seal penetration, the MCA assumed a Type 1 barrier failure probability between fire compartments. The NRC staff found the licensee's evaluation not consistent with the guidance in NUREG/CR-6850, which is to sum the failure probabilities of all barriers present. However, the NRC staff also found that applying the sum of the barrier failure probabilities for each type of barrier present would yield a negligible risk increase, given the CDF and LERF contribution of MCA scenarios provided in the licensee's response to PRA RAI 01.o (Reference 12). In its response to PRA.29.a (Reference 14), the licensee stated that the screening criteria had been eliminated for the PRA. The NRC staff finds this issue to be resolved because the PRA has been updated to be consistent with the guidance in NUREG/CR-6850 (with one exception noted above), and the transition change-in-risk estimates, submitted by the licensee on September 12, 2014 (Reference 17), used this updated analysis.

In PRA RAI 01.p (Reference 22), the NRC staff requested that the licensee provide justification for the use of generic fire scenarios to determine the non-suppression probabilities for each physical analysis unit (PAU) analyzed as part of the MCA. In its response to PRA RAI 01.p (Reference 12), the licensee clarified that the NSP value associated with a bounding fire scenario, which includes a bounding secondary combustible configuration, is applied to the total PAU ignition frequency in combination with a barrier failure probability to generate a probability

of multi-compartment damage. In its response to PRA RAI 01.p.01 (Reference 14), the licensee further explained that for high-energy arcing fault (HEAF) fire scenarios, the FPRA would be updated to take no credit for any time delay to damage or ignition in the initiating compartment or for a multi-compartment fire scenario. All HEAF fires are thus assumed to contribute to a hot gas layer (HGL) scenario for the affected fire zones and damage all components and cables within. In its response to PRA RAI 29 (Reference 14) and (Reference 17), the licensee stated that no delay to damage or ignition of targets for HEAF scenarios will be credited in the PRA consistent with the guidance in NUREG/CR-6850. The NRC staff finds this issue to be resolved because the PRA has been updated to use acceptable guidance, and the transition change-in-risk estimates submitted by the licensee on September 12, 2014 (Reference 17), used this updated analysis.

In PRA RAIs 01.q (Reference 22) and PRA RAI 01.q.01 (Reference 24), the NRC staff requested that the licensee provide justification that the generic fire protection system reliabilities and availabilities used in the FPRA are representative of plant-specific operating experience. In its response to PRA 01.q (Reference 10), the licensee clarified that it reviewed plant-specific operating experience over a 3-year period to identify fire system impairments, including those associated with penetrations, doors, detection systems, and suppression systems. In its response to PRA RAI 01.q.01 (Reference 14), the licensee further stated that the data over this time period are representative of current and older data and that no outlier behavior was identified in the review. The NRC staff finds this issue to be resolved because the licensee evaluated plant operating experience and stated that the experience supports the values used.

In its response to PRA RAIs 01.r and 08 (Reference 12), the licensee removed the VEWFDS credit for all fire scenarios in the MCR. In its response to PRA RAI 01.r.02 (Reference 14), the licensee further explained that in-cabinet smoke detection would not be credited in lieu of incipient detection to preclude damage in the panel in which it is installed. In its response to PRA RAI 29 (Reference 14) and (Reference 17), the licensee stated that that it eliminated PRA credit for in-panel fire detection in the MCR. The NRC staff finds this issue to be resolved because the PRA has been updated to remove all credit for in-panel detection in the MCR, and the transition change-in-risk estimates, submitted by the licensee on September 12, 2014 (Reference 17) do not include this detection.

In its response to PRA RAI 01.r.02 (Reference 14) and PRA RAI 01.r.02.c.01 (Reference 16), the licensee explained that for the MCR, fire propagation between adjacent non-main control board (MCB) electrical cabinets, which was not considered by the original analysis, would be updated to be consistent with the guidance in Appendix S of NUREG/CR-6850. The licensee also clarified, however, that damage to sensitive electronics within cabinets adjacent to an ignition source and separated by a double wall with an air gap is precluded, based on the assumption that a continuously manned control room will ensure that fire suppression efforts will be initiated within a short time (i.e., 10 minutes). Although Appendix S identifies that such damage can only be prevented if the fire is extinguished within 10 minutes, the NRC staff considers this to be risk insignificant. In its responses to PRA RAI 29.a (Reference 14) and PRA RAI 29.c.i (Reference 17), the licensee stated that all other aspects of the MCR analysis on non-MCB cabinets were revised to be consistent with the guidance in Appendix S of NUREG/CR-6850. The NRC staff finds this issue to be resolved because the PRA has been updated to be consistent with the guidance in Appendix S of NUREG/CR-6850 (with one

exception noted above), and the transition change-in-risk estimates, submitted by the licensee on September 12, 2014 (Reference 17), use this updated analysis.

In its response to PRA RAI 01.t (Reference 12), the licensee updated the FPRA to remove a UAM that applied conditional probabilities to electrical cabinet scenarios as a means to reduce the probability of the propagation of a fire. As a replacement for these conditional probabilities, the licensee, in response to PRA RAI 01.t.01 (Reference 14), presented a methodology that centers on determining time to target damage based on a heat flux analysis that considers a target's distance from the ignition source. The acceptability of this methodology in evaluating target damage times is discussed in SE Section 3.4.2.3. The licensee clarified that the suppression event tree has been revised to ensure that any dependencies between fire scenario development branch points are taken into account when calculating the overall NSP for each fire scenario for ignition sources where target damage is based on heat flux. Furthermore, the licensee clarified that a minimum manual NSP of 0.001 is assumed in accordance with the guidance in NUREG/CR-6850. Additionally, the licensee clarified for those cases that credit automatic detection, suppression event trees have been revised to address the failure probability of the system, as well as a 15-minute delay to manual detection, should the detection system fail. In its response to PRA RAI 29.a (Reference 14) and PRA RAI 29.c (Reference 17), the licensee stated that the UAM had been eliminated and that it "incorporated use of NUREG/CR-6850, Appendix H." In its response to PRA.29.a, the licensee stated that the screening criteria had been eliminated for the PRA. The NRC staff finds this issue to be resolved because the PRA has been updated to address dependencies between suppression activities and the impact of detection system failure on fire scenario development consistent with guidance in NUREG/CR-6850, and the transition change-in-risk estimates, submitted by the licensee on September 12, 2014 (Reference 17), use this updated analysis.

In PRA RAI 01.u (Reference 22), the NRC staff requested that the licensee provide justification for credit given to Thermolag for preventing cable damage in HEAF scenarios. In its response to PRA RAI 01.u (Reference 11), the licensee stated that the raceways of concern were located above the panels for which the HEAF scenarios were postulated. The NRC staff finds that because these cables are wrapped, they are considered protected per Appendix M of NUREG/CR-6850. The NRC staff concludes that this issue is resolved because credit for fire wrap in HEAF scenarios is consistent with the ZOI defined in Appendix M of NUREG/CR-6850.

In PRA RAI 01.v (Reference 22), the NRC staff notified the licensee that credit taken in the FPRA for manual and automatic suppression did not explicitly consider the time to detection or suppression system actuation. In its response to PRA RAI 01.v (Reference 12), the licensee clarified that, for fire areas with automatic smoke detection, the time to detection for manual suppression is judged to be negligible. The licensee stated that the time to detection for manual suppression is consistent with Appendix P of NUREG/CR-6850 for fire areas without automatic smoke detection. In its response to PRA RAI 01.v.01 (Reference 14), the licensee further clarified that credit for automatic suppression systems is only credited in PAUs where the automatic suppression system is actuated by smoke detection, for which the time to detection is judged to be negligible; by thermal wiring physically installed within cable trays that must ignite in order to cause propagation of fire to trays that the suppression system is credited to protect; and by thermal detectors with setpoints below temperatures assumed for the HGL, for which prevention by the suppression system is credited. The NRC staff finds this issue to be resolved

because the licensee's evaluation includes consideration of the time to actuate credited detection and suppression systems consisted with accepted guidance.

In PRA RAI 01.z.i (Reference 22), the NRC staff requested that the licensee explain how transient fires were placed to cover pinch points where conditional core damage probabilities (CCDPs) are highest for a given PAU. In its response to PRA RAI 01.z.i (Reference 10), and PRA RAI 01.z.i.01 (Reference 14), the licensee clarified that transient scenarios are postulated anywhere within a fire zone where equipment or cables could be impacted except next to a fixed ignition source if that source was the only component impacted by the transient. However, as discussed in the response to PRA RAI 01.z.ii (Reference 12) and 01.z.ii.01 (Reference 14), the licensee stated that it will postulate transient fires behind individual and adjoining open-back panels and MCBs located in the MCR. In its response to PRA RAI 29 (Reference 14) and (Reference 17), the licensee stated that it will incorporate this updated treatment of MCR transient fire placement into the PRA, and the updated transition change-in-risk estimates will use the updated PRA. The NRC staff finds this issue to be resolved because the PRA has been updated and the transition change-in-risk estimates, submitted by the licensee on September 12, 2014 (Reference 17), include transient fires behind appropriate MCB panels.

In PRA RAI 07.01 (Reference 24), the NRC staff requested that the licensee provide justification regarding the counting of Bin 15 electrical cabinets. In its response to PRA RAI 07.01 (Reference 14), the licensee clarified that the FPRA would be updated to exclude counting well-sealed and robustly secured electrical cabinets below 440V. This would make the licensee's overall counting methodology for Bin 15 electrical cabinets consistent with the guidance in NUREG/CR-6850, Chapter 6. In its response to PRA RAI 07 (Reference 10), the licensee clarified that the criteria used to determine whether an electrical cabinet below 440V is well-sealed and robustly secured are consistent with the guidance in FAQ 08-0042 (Reference 76). In its response to PRA RAI 29.a (Reference 14), the licensee stated that the guidance for excluding well-sealed panels had been incorporated into the PRA. The NRC staff finds this issue to be resolved because the PRA has been updated to use acceptable guidance, and the transition change-in-risk estimates, submitted by the licensee on September 12, 2014 (Reference 17), use this updated analysis.

In PRA RAI 07.01.c.01 (Reference 26), the NRC staff notified the licensee that fires in a subset of Bin 15 electrical cabinets (e.g., motor control centers (MCCs) above 440V) were not assumed to propagate outside the ignition source panel, as these were determined by the licensee to be well-sealed and robustly secured. In its response to PRA RAI 07.01.c.01 (Reference 17), the licensee stated that the FPRA would be updated to use a value of 0.1 to characterize the likelihood that a fire can breach a well-sealed and robustly secured MCC and impact targets external to the MCC. Draft FAQ 14-0009 (Reference 107), provides a proposed generic approach to develop the likelihood that a fire propagates outside of a 440V alternating current or higher electric cabinet and damages nearby targets. The analysis in the FAQ yields a likelihood that a fire in a cabinet damages cables 6 inches above the cabinet and provides an approach for evaluating different physical configurations. The analysis supports a probability of 0.1 for cabinet breach given a fire and damaging nearby targets outside the cabinet. The NRC staff finds the licensee's use of this 0.1 probability acceptable, but only for well-sealed and not all electrical cabinets. The use of 0.1 probability has an adequate and acceptable technical basis for a well-sealed MCC breach and fire damage because it is consistent with the available operating experience and it is systematically applied to a representative physical configuration.

The licensee's evaluation also uses 0.1 for the probability of breaching a well-sealed MCC and damaging nearby targets outside the MCC. Therefore, the NRC staff finds the licensee's evaluation acceptable.

In its response to PRA RAI 29.c.i (Reference 17), the licensee stated that the acceptable methodology has been incorporated into the PRA. The NRC staff finds this issue to be resolved because the PRA has been updated to use acceptable guidance, and the transition change-in-risk estimates, submitted by the licensee on September 12, 2014 (Reference 17), use this updated analysis.

In PRA RAI 08 (Reference 22), the NRC staff requested that the licensee provide clarification on the licensee's treatment of MCB fires, including frequency apportionment. In its response to PRA RAI 08 (Reference 12), as clarified by its response to PRA RAI 01.r.01 (Reference 14), the licensee updated the FPRA to reflect abandonment and non-abandonment scenarios for each unit's MCB. Each scenario applied the full Bin 4 frequency and incorporated the use of Appendix L of NUREG/CR-6850, assuming a zero distance between targets. Each scenario was further adjusted by an MCR abandonment probability developed using methods discussed in SE Section 3.4.2.3. In its response to PRA RAI 29 (Reference 14) (Reference 17), the licensee stated that it updated the PRA to incorporate this revised treatment of MCB fires. The NRC staff finds this issue to be resolved because the PRA has been updated to incorporate the guidance from Appendix L of NUREG/CR-6850 for MCB fires, and the transition change-in-risk estimates, submitted by the licensee on September 12, 2014 (Reference 17), use this updated analysis.

In PRA RAIs 08 (Reference 22), and PRA RAI 01.r.02 (Reference 24), the NRC staff requested that the licensee provide further clarification on several potential non-conservatisms noted in the development of MCR fire scenarios. In its response to PRA RAI 08.01 (Reference 14), the licensee updated the MCR analysis to conservatively assume multiple cable bundles for each electrical panel, unless a walkdown confirmed otherwise; assume that the heating, ventilation, and air conditioning (HVAC) and door configuration produce the most bounding abandonment times; and assume an NSP of no less than 0.001, unless an HRR bin would be incapable of exceeding abandonment criteria at any time. In its response to PRA RAI 29 (Reference 14) and (Reference 17), the licensee stated that it updated the PRA to incorporate these revisions. The NRC staff finds this issue to be resolved because the licensee updated the PRA to either reflect or bound actual cable configurations within the MCR, produce bounding abandonment times, and be consistent with the guidance in Appendix P of NUREG/CR-6850 and because the transition change-in-risk estimates, submitted by the licensee on September 12, 2014 (Reference 17), use this updated analysis.

In its response to PRA RAI 13.01.a (Reference 14), the licensee discussed two fire areas (the CSR and the breezeway) that utilize alternate shutdown strategies prior to NFPA 805. An alternative shutdown strategy uses the alternative shutdown panel (ASP) if the MCR is abandoned. In its response to PRA RAI 13.01.c.01 (Reference 17), the licensee stated that the CSR compliant risk was estimated assuming that the MCR was always abandoned (on loss of control) following any fire and using only equipment available at the ASP. The CCDP for failing to shutdown following MCR abandonment was reported to be 0.0517. In contrast to the compliant case, the variant plant FPRA models the effects of each fire. The licensee further stated, "[v]ariant case fire scenarios where the CCDP is less than this compliant case

CCDP...[will]...not contribute to the delta risk." The licensee achieves this zero delta risk contribution by using the variant case CCDP as the compliant case CCDP whenever the variant case CCDP is less than the compliant case risk.

The NRC staff finds the licensee's modeling all compliant case fires in the CSR as causing MCR abandonment due to loss of control and shutdown using only the ASP does not represent the as-built and as-operated plant configuration as required by NFPA 805, Section 2.4.3.3. Procedures for alternate shutdown areas describe what should be operated after MCR abandonment but do not require MCR abandonment. Assuming that only the ASP is available will overestimate the compliant plant risk, and therefore, potentially underestimate the change in risk. However, this non-conservative assumption is mitigated in the licensee's proposed method by setting any lower variant plant CCDP to be equal to the compliant plant CCDP in the transition change-in-risk calculations that will prevent any artificial risk decrease from affecting the change-in-risk results.

The NRC staff further considered the effect of this MCR abandonment modeling on the transition change-in-risk estimates. LAR Attachment W, Tables W-6 and W-7, as supplemented, provide the estimates for the variant plant CDF and ΔCDF (i.e., the variant minus the compliant plant CDF). From the provided estimates, the CDF for the Unit 4 compliant plant CSR can be estimated as 1.0E-06/year. The compliant plant is modeled with a single CCDP using a value of 0.056. Therefore, the frequency of MCR abandonment due to loss of control from fires in the Unit 4 CSR is 1.8E-05/year. The estimate of the reduction in CDF from risk-reduction modifications in a different fire area is 1.85E-04/year. Conservatively assuming the compliant plant CSR has a zero CCDP would only increase the transition ΔCDF by a maximum of 1.8E-05/year (i.e., the total abandonment frequency). This increase is about a factor of 10 less than the risk decrease, and therefore, the transition ΔCDF would still be less than zero and meet the risk acceptance guidelines. Similar calculations can be made and similar results obtained for ΔLERF and for Unit 3. The NRC staff finds that the information provided by the licensee is sufficient to demonstrate that fires in the CSR do not cause the acceptance guidelines to be exceeded, regardless of the method used to estimate the change-in-risk contribution. The licensee stated that the variant plant FPRA models the effects of each fire. Therefore, the NRC staff concludes that the post-transition self-approval process will use a PRA that models the as-built and as-operated plant and is acceptable.

The licensee's response to PRA RAI 13.01.a (Reference 14) also discusses the second fire area that utilizes an alternative shutdown strategy prior to NFPA 805 transition, which is the Auxiliary Building North-South Breezeway. The licensee stated:

> The variant-case CDF for this area was treated in the same manner as non-alternate-shutdown areas with the quantification based on the fire impacts in each specific scenario. No compliant case was defined for this area with the delta CDF/LERF conservatively assumed to be equal to the variant-case CDF/LERF, thus assuming a compliant-case CDF/LERF of zero.

The NRC staff finds the treatment of the second alternative shutdown strategy fire area to be acceptable because the licensee evaluated the area consistent with the methods described in FAQ 08-0054 (Reference 80).

In its responses to PRA RAI 11 (Reference 10), PRA RAI 11.01 (Reference 14), and PRA RAI 13 (Reference 10), the licensee described its methodology to evaluate risk from MCR abandonment due to loss of MCR habitability. When the MCR is abandoned because of loss of habitability, the facility is shut down using the ASP and associated equipment. The methodology identified three categories of MCR fire induced scenarios characterized by three different levels of challenges to the operators. Therefore, there are three different probabilities of failure to successfully shutdown the plant. The simplest challenge occurs when there are no time critical actions and few fire induced failures allowing straightforward shutdown from the ASP. The intermediate challenge is applied when there are more significant fire induced failures that could complicate shutdown from the ASP. The most complex challenge is applied when there are significant fire induced failures that may not to be recoverable from the ASP based on the current design and operating procedures. The NRC staff finds that the use of these three categories appropriately characterizes the complexity of the required operator actions to the extent necessary to differentiate among the failure probabilities, and therefore, concludes that the modeling of MCR abandonment due to loss of habitability in the FPRA is acceptable.

In PRA RAI 12 (Reference 22), the NRC staff notified the licensee that new information indicated the reduction in hot short probabilities for circuits provided with control power transformers (CPTs) identified in NUREG/CR-6850 was too high and should be reduced. In its response to PRA RAI 29 (Reference 14) and (Reference 17), the licensee stated that the original credit will be removed and replaced with Interim Technical Guidance values (Reference 108) before completing the final transition change-in-risk estimates. The NRC staff finds this issue to be resolved because the PRA has been updated to use acceptable CPT credit values, and the transition change-in-risk estimates submitted by the licensee on September 12, 2014 (Reference 17) use this updated analysis.

In PRA RAI 17 (Reference 22), NRC staff requested the licensee identify any changes made to the FPRA that are consistent with the definition of a "PRA upgrade" since the last full-scope peer review of PRA models as defined by the ASME/ANS PRA Standard (Reference 45). In its response to PRA RAI 17 (Reference 10), the licensee discussed revisions made since the last full-scope peer review and did not identify any changes meeting the definition of a PRA upgrade. The licensee concluded that there was no need for a follow-on focused-scope peer review. However, after implementing a number of PRA model and method refinements using NRC-accepted methods in a letter dated April 4, 2014 (Reference 14), the licensee submitted a revised LAR Attachment S, Table S-3 and included a new implementation item to perform a focused-scope peer review on any such refinement that constitutes a PRA upgrade and to resolve findings prior to self-approval of post-transition changes. The licensee submitted its final version of LAR Attachment S (Reference 18) and included this action as Implementation Item 23. The NRC staff concludes that this action is acceptable because it will incorporate the provisions of NFPA 805 in the FPP and would be required by the proposed license condition.

In PRA RAI 18 (Reference 22), the NRC staff identified the licensee's use of a reduced HRR of 69 kilowatts (kW) for modeling transient fires. In its response to PRA RAI 18.01 (Reference 14), the licensee reviewed location-specific attributes and considerations applicable to each individual fire zone that credits this reduced HRR, in accordance with the guidance provided in a letter from Joseph Giitter, U.S. Nuclear Regulatory Commission, to Biff Bradley, NEI, dated June 21, 2012 (Reference 109). The licensee also clarified that the controls to be imposed will

restrict all transients in the affected zones with specific compensatory actions to be in place during the timeframes when transients will be placed within the zone. In a letter dated April 4, 2014 (Reference 14), the licensee revised LAR Attachment S, Table S-3 to include a new implementation item to revise administrative controls to restrict storage of transient combustibles and ignition sources commensurate with credit taken in the FPRA. The licensee submitted its final version of LAR Attachment S (Reference 18) and included this action as Implementation Item 21. The NRC staff concludes that this action is acceptable because it will incorporate the provisions of NFPA 805 in the FPP and would be required by the proposed license condition. The licensee also performed a review of past transient fire experience and concluded, in its response to PRA RAI 18.01.01 (Reference 16), that identified at-power violations represent isolated incidents and do not demonstrate a general pattern of transient control violation in fire zones/areas that use the reduced transient HRR. The NRC staff concludes that the licensee's use of a reduced transient HRR is consistent with the guidance in the NRC letter to NEI dated June 21, 2012, and therefore, is acceptable.

In PRA RAI 19 (Reference 22), the NRC staff requested that the licensee provide clarification on how fire-induced instrument failures are modeled in the FPRA. In its response to PRA RAI 19.01 (Reference 14), the licensee clarified that as part of developing detailed HEP values consistent with NUREG-1921, the FPRA would be updated to model associated instrumentation cues directly within the quantification fault tree in accordance with NUREG-1921, should such cues be lost due to fire. The licensee further clarified that the availability of cues and instrumentation that support operator actions credited in the FPRA would be correlated to the SSA, given that post-fire shutdown procedures direct operators, on a fire area basis, to the available instrumentation on which they can rely. As part of implementing NUREG-1921 approaches, in its response to PRA RAI 29 (Reference 14) and (Reference 17), the licensee incorporated this revised treatment of fire-induced instrument failures into the PRA. The NRC staff finds this issue to be resolved because the licensee updated the PRA, and the transition change-in-risk estimates, submitted by the licensee on September 12, 2014 (Reference 17), use this updated analysis.

In its response to PRA RAI 29.b (Reference 14), the licensee indicated that it developed a Flowserve RCP seal PRA model (i.e., logic structure and basic event values) for the Flowserve RCP seal package that is to be installed as a risk-reduction measure as indicated in LAR Attachment S, Table S-2, Item 33. In its response to PRA RAI 29.b.01 (Reference 16), the licensee provided technical design and testing evaluations that support the Flowserve RCP PRA model in the PRA. The licensee revised LAR Attachment S, Table S-3 to include Implementation Item 22 to replace the seal PRA model in the current Flowserve Topical Report with the model in the final, NRC-approved Topical Report, if applicable. The implementation item requires the licensee to take appropriate action in order to maintain the risk within the self-approval limits, if this change results in a risk increase above the self-approval limits. The NRC staff concludes that this action is acceptable because it will incorporate the provisions of NFPA 805 in the FPP and would be required by the proposed license condition. The NRC staff finds this issue to be resolved because the licensee used the best available PRA model based on current technical evaluations to estimate the associated change in risk, and the licensee will take appropriate action if replacing the current model with the final approved PRA model results in a risk increase above the self-approval acceptance guidelines.

As a result of its review of the LAR, as supplemented, the NRC staff concludes that the Turkey Point FPRA possesses sufficient technical adequacy and that its quantitative results, considered together with the sensitivity studies, can be used to demonstrate that the change in risk due to the transition to NFPA 805 meets the acceptance guidelines in RG 1.174, and therefore, is acceptable.

3.4.2.3 Fire Modeling in Support of the Development of the Fire Risk Evaluations

The NRC staff performed detailed reviews of the FM used to support the FREs in order to gain further assurance that the methods and approaches used for the application to transition to NFPA 805 (Reference 3) were technically adequate. NFPA 805 has the following requirements that pertain to FM used in support of the development of the FREs:

NFPA 805, Section 2.4.3.3, "On Acceptability," states:

> The PSA approach, methods, and data shall be acceptable to the AHJ.

NFPA 805, Section 2.7.3.2, "Verification and Validation," states:

> Each calculational model or numerical method used shall be verified and validated through comparison to test results or comparison to other acceptable models.

NFPA 805, Section 2.7.3.3, "Limitations of Use," states:

> Acceptable engineering methods and numerical models shall only be used for applications to the extent these methods have been subject to verification and validation. These engineering methods shall only be applied within the scope, limitations, and assumptions prescribed for that method.

NFPA 805, Section 2.7.3.4, "Qualification of Users," states:

> Cognizant personnel who use and apply engineering analysis and numerical models (e.g., fire modeling techniques) shall be competent in that field and experienced in the application of these methods as they relate to nuclear power plants, nuclear power plant fire protection, and power plant operations.

NFPA 805, Section 2.7.3.5, "Uncertainty Analysis," states:

> An uncertainty analysis shall be performed to provide reasonable assurance that the performance criteria have been met.

The following sections discuss the results of the NRC staff's reviews of the acceptability of the FM (first requirement). The results of the NRC staff's review of compliance with the remaining requirements are discussed in SE Sections 3.8.3.2 through 3.8.3.5.

3.4.2.3.1 Overview of Fire Models Used to Support the Fire Risk Evaluations

A fire's ZOI around ignition sources was determined based on information in the generic fire modeling treatments (GFMTs) approach. The GFMTs approach provides the horizontal and vertical dimensions of the ZOI for various ignition sources (transient fuel packages, small liquid fuel fires, open cabinets, and cable trays) and different types of targets (i.e., thermoplastic and thermoset cables as defined in NUREG/CR-6850, and Class A combustibles). The GFMTs approach includes a set of tables that are used to determine if and when the HGL temperature exceeds the damage threshold of specified targets depending on fire size, room volume, and ventilation conditions. The GFMTs approach was used as a basis for the scoping or screening evaluation as part of the FM to support FREs.

The ZOI tables in the GFMTs approach were obtained by using a collection of algebraic models and empirical correlations. The primary algebraic fire models and empirical correlations that were used for this purpose are:

- The Heskestad Flame Height Correlation and Plume Temperature Correlation (Reference 110);
- Shokri and Beyler flame radiation model (Reference 111).

These algebraic models are described in NUREG-1805, "Fire Dynamics Tools (FDTs): Quantitative Fire Hazard Analysis Methods for the US Nuclear Regulatory Commission Fire Protection Inspection Program" (Reference 56). V&V of these algebraic models is documented in NUREG-1824, "Verification and Validation of Selected Fire Models for Nuclear Power Plant Applications," Volume 3 (Reference 57). The V&V of the fire models that were used to support the FPRA is discussed in SE Section 3.8.3.2.

The Consolidated Model of Fire and Smoke Transport (CFAST) computational fire model, Version 6 (Reference 112), was used to generate the HGL tables in the GFMT approach. The FPRA used these calculations to further screen ignition sources, scenarios, and compartments that would not be expected to generate an HGL, and to identify the ignition sources that have the potential to generate an HGL for further analysis. CFAST was also used for the MCR abandonment time calculations. The V&V of CFAST is documented in NUREG-1824, Volume 5 (Reference 57).

The licensee also identified the use of the following empirical models that are not addressed in NUREG-1824, in the development of the GFMTs approach:

- Mudan flame radiation model (Reference 113);
- Plume heat flux correlation by Wakamatsu et al. (Reference 114);
- Yokoi plume centerline temperature correlation (Reference 115) and (Reference 116);
- Hydrocarbon spill fire size correlation (Reference 117);

- Flame extension correlation (Reference 118);
- Delichatsios line source flame height model (Reference 119);
- Corner flame height correlation (Reference 118);
- Kawagoe natural vent flow equation (Reference 120);
- Yuan and Cox line fire flame height and plume temperature correlations (Reference 121);
- Lee cable fire model (Reference 122); and
- Babrauskas method to determine ventilation-limited fire size (Reference 123).

In revised ZOI and HGL calculations for fires that involve secondary combustibles (cable trays), the licensee used the following model to calculate fire propagation in the corresponding HRR of cable trays:

- Correlation for Flame Spread over Horizontal Cable Trays, Flame Spread over Horizontal Cable Trays (FLASH-CAT), described in NUREG/CR-7010, Section 9 (Reference 58).

The V&V of these models is discussed in SE Section 3.8.3.2.

The licensee used the ZOI approach as a screening tool to distinguish between fire scenarios that required further evaluation and those that did not. The licensee stated that qualified personnel performed a plant walk-down to identify ignition sources, surrounding targets, and safety related SSCs, and applied the GFMTs approach to assess whether the SSCs were within the ZOI of a fire scenario. Based on the fire hazard present in the fire areas, these generalized ZOIs were used to screen from further consideration those plant-specific ignition sources that did not adversely affect the operation of credited SSCs or targets following a fire. The licensee based its screening on the 98th percentile HRR from the NUREG/CR-6850 methodology.

3.4.2.3.2 Discussion of RAIs Pertaining to Fire Modeling

In a letter dated March 15, 2013 (Reference 22), the NRC staff sought additional information (RAIs) concerning the FM conducted to support the FPRA. In letters dated March 18, 2013 (Reference 10); April 16, 2013 (Reference 11); and May 15, 2013 (Reference 12), the licensee responded to the RAIs. In a letter dated November 7, 2013 (Reference 23), the NRC sent additional RAIs to the licensee. By letter dated January 7, 2014 (Reference 13), the licensee provided responses to the RAIs.

- In FM RAI 01.a (Reference 22), the NRC staff requested that the licensee explain why the purge mode was not considered in the MCR abandonment time calculations and how the ratios of fresh versus recirculated air were determined.

In its response to FM RAI 01.a (Reference 10), the licensee stated that there is no purge mode for the HVAC system in the MCR. The licensee further stated that there are three modes of operation for the HVAC system, which are normal, filtered pressurization, and recirculation. The licensee stated that during normal operation, the amount of outside air introduced into the system is 0.47 m^3/s, and for the other modes of operation, no outside air is introduced into the room. The licensee further stated that the flow rates for each area are determined from available HVAC drawings.

The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee demonstrated that the purge mode was not considered in the MCR abandonment time calculations and how the ratios of fresh air versus recirculated air were determined.

- In FM RAI 01.b (Reference 22), the NRC staff requested that the licensee provide the basis for the assumption in the MCR abandonment study that the fire brigade is expected to arrive within 15 minutes, and to discuss possible adverse effects of not meeting this assumption on the results of the FPRA.

  In its response to FM RAI 01.b (Reference 10), the licensee indicated that based on fire brigade drills, the response time is expected to be 12 - 23 minutes. The licensee further explained that the MCR abandonment time calculations were performed for all six combinations of two HVAC conditions (HVAC in normal mode and HVAC inoperative) and three natural ventilation conditions (door open from the start, door opens at 15 minutes, and door closed) and that the 15 minutes is based on the assumed fire brigade arrival time. The licensee tabulated selected results from the MCR abandonment time calculations and showed that the effect of the natural ventilation conditions (door open from the start versus closed throughout the simulation) on the probability for MCR abandonment is very small generally two orders of magnitude smaller than the abandonment probability. The licensee further stated that it used a maximum immersion temperature of 50 °C as the tenability threshold, which is much lower than the recommended value in NUREG/CR-6850 (Reference 50), and a sensitivity analysis shows that this conservative assumption reduces the calculated abandonment times by up to 5 minutes.

  The NRC staff concludes that the licensee's assumption concerning the fire brigade arrival time in the MCR abandonment time calculations is acceptable because the licensee demonstrated that the fire brigade arrival time is based on the results of actual fire brigade drills.

- In FM RAI 01(c) (Reference 22), the NRC staff requested that the licensee provide technical justification for the assumptions used concerning selection of transient HRR and fire growth rate.

  In its response to FM RAI 01(c) (Reference 10), the licensee stated that it chose a "medium" t^2 fire growth rate based on data in the Society of Fire Protection Engineers (SFPE) Handbook (Reference 124). The licensee explained that for

Bins 1 – 5, a "medium" t^2 fire growth rate leads to shorter calculated abandonment times, and that for the remaining bins, the growth rate in FAQ 08-0052 (Reference 79) results in shorter abandonment times. The licensee further stated that a sensitivity analysis showed a medium t^2 growth rate leads to a probability for MCR abandonment, which may be significantly lower than that based on the assumption that transient fires reach peak HRR in 2 minutes, as discussed in FAQ 08-0052 for loose trash. The licensee further stated that the sensitivity analysis also showed that the use of a maximum immersion temperature of 95 °C, as recommended in NUREG/CR-6850, instead of the 50 °C used in the MCR abandonment time calculations, negates the effect of the fire growth rate assumption on the probability for abandonment.

The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee provided adequate technical justification for the transient fire growth rate postulated in the MCR abandonment study

- In FM RAI 01.d (Reference 22), the NRC staff requested that the licensee provide technical justification for using the upper bound heat of combustion for the cable mix in the MCR panels (as opposed to the lower bound value, which is more conservative) in the MCR abandonment time calculations.

  In its response to FM RAI 01.d (Reference 10), the licensee stated that the cable properties used in the MCR abandonment time study were based on an assumed equal mix of polyethylene (PE) and PVC cables in the main control board. The licensee further stated that it based the heat of combustion in the MCR abandonment time calculations on the average upper bound values for PE and PE/PVC cables. The licensee performed a sensitivity analysis to determine the effect of using the lower bound values, which showed that the abandonment times with the lower bound heat of combustion are within approximately 0.6 minutes, and in many cases, are identical to the baseline values. The licensee stated that overall, the baseline case is generally more conservative than the sensitivity case, at least for the scenarios that were considered in the sensitivity analysis.

  The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee provided adequate technical justification for the value for the heat of combustion of cables assumed in the MCR abandonment time calculations.

- In FM RAI 01.e (Reference 22), the NRC staff requested that the licensee explain how the results of the sensitivity analysis in the MCR abandonment time study were used in the FPRA, and describe the criteria that were used in the sensitivity runs to determine whether the reduction of the abandonment time from the baseline value is significant or not.

  In its response to FM RAI 01.e (Reference 10), the licensee explained that it did not use the sensitivity analysis directly in the FPRA and that the intent of the sensitivity analysis is to identify input parameters whose variation can lead to

non-conservative results. The licensee further stated that the metrics used to make the determination were qualitative and based on the total change in abandonment time. The licensee further demonstrated that the baseline parameter selection is either conservative or does not have a significant effect on the probability for MCR abandonment.

The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee demonstrated that the baseline parameter is either conservative or does not have a significant effect on the probability for MCR abandonment.

- In FM RAI 01.f (Reference 22), the NRC staff requested that the licensee explain how fire location effects were accounted for in the MCR abandonment calculations for fire scenarios that involve an electrical cabinet with vents that are within 2 feet of a wall or corner.

  In its response to FM RAI 01.f (Reference 10), the licensee explained that in its response to FM RAI 01.p, additional walkdowns of the analyzed areas will be performed to identify electrical cabinets with vents within 2 feet of a wall or a corner. In its subsequent response to FM RAI 01.f (Reference 11), the licensee stated that the additional walkdowns identified one panel in each unit with vents within 2 feet of a wall, and the MCR abandonment time calculations were revised to include scenarios with a single panel in close proximity to a wall.

  The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee demonstrated that the location effects for electrical cabinet fires in the MCR were appropriately accounted for.

- In FM RAI 01.g (Reference 22), the NRC staff requested that the licensee provide technical justification for not considering secondary combustibles in the MCR abandonment time calculations.

  In its response to FM RAI 01.g (Reference 10), the licensee explained that a review of the raceway drawings identified a single tray and a stack of two trays routed above several closed electrical cabinets outside the operator area. The licensee stated that a sensitivity analysis showed that including fire scenarios, which involve these cable trays as secondary combustibles, has a significant adverse effect on the probability for MCR abandonment. The licensee further stated that the sensitivity analysis also showed the use of a maximum immersion temperature of 95 °C, as recommended in NUREG/CR-6850, instead of 50 °C used in the MCR abandonment time calculations, negates the effect of including scenarios with intervening combustibles on the probability for abandonment. The licensee revised the abandonment time calculations to include panel fire scenarios that involve secondary combustibles.

  The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee demonstrated that panel fires involving secondary

combustibles (cable trays) were appropriately accounted for in the MCR abandonment time calculations.

- In FM RAI 01.h (Reference 22), the NRC staff requested that the licensee explain how the modification to the critical heat flux for a target that is immersed in a thermal plume in accordance with the GFMTs approach was used in the ZOI determination.

  In its response to FM RAI 01.h (Reference 10), the licensee explained that the continuous curves in the GFMTs that show the modified critical heat flux as a function of immersion temperature, were 'discretized' into three bins. The licensee further stated that the GFMT ZOI tables for non-IEEE-383 (Reference 96) cables are applied without any modification for thermoplastic cable targets if the immersion temperature is 80 °C or less. Further, the license stated that if the immersion temperature is between 80 °C and 131.6 °C, the GFMT tables for solid state control components are used to determine the ZOI for non-IEEE-383 qualified/thermoplastic cable targets. The licensee further stated that if the immersion temperature exceeds 131.6 °C, full room burn-out is assumed.

  The NRC staff concludes that the licensee responses to the RAI are acceptable because the licensee demonstrated that properly applied the approach used to determine the ZOI of targets immersed in a hot gas environment.

- In FM RAI 01.j (Reference 22), the NRC staff requested that the licensee provide technical justification to demonstrate that the GFMTs approach, as used to determine the ZOI of fires that involve multiple burning items, is conservative and bounding.

  In its response to FM RAI 01.j (Reference 12), the licensee stated that an evaluation of the impact of secondary combustibles on the ZOI of an ignition source is in progress. In FM RAI 01.01 (Reference 23), the NRC staff requested that the licensee provide the results of the evaluation for review. In its response to FM RAI 01.01 (Reference 13), the licensee referred to a new set of ZOI calculations that resulted in ZOI tables for various ignition sources without any intervening combustibles, and in combination with a stack of between one and five cable trays, or two stacks of four or five trays. The licensee stated that the new tables are used in lieu of the GFMTs to determine the ZOI of fires that involve cable trays.

  The NRC staff concludes that the licensee's responses to the RAI are acceptable because the licensee demonstrated that the approach used to determine the ZOI of fires that involve secondary combustibles is conservative and bounding.

- In FM RAI 01.k (Reference 22), the NRC staff requested that the licensee describe how the flame spread and fire propagation in cable trays, and the corresponding HRR of cables, was determined, and to explain how these calculations affect the ZOI determination and HGL temperature calculations

In its response to FM RAI 01.k (Reference 12), the licensee described the method used as being Supplement 2 of the GFMTs approach. The licensee developed new ZOI and HGL tables for fires that involve secondary combustibles and stated that the fire propagation in cable trays and corresponding HRR were determined based on the models described in NUREG/CR-6850, Appendix R and NUREG/CR-7010 (FLASH-CAT).

The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee demonstrated that the approach used to calculate fire propagation in cable trays is based on NRC-endorsed guidance.

- In FM RAI 01.l (Reference 22), the NRC staff requested that the licensee describe how transient combustibles in an actual plant setting are characterized in terms of the three fuel package groupings in the GFMTs approach; to identify areas, if any, where the NUREG/CR-6850 transient combustible HRR characterization may not encompass typical plant configurations; and to explain if any administrative action will be used to control the type of transients in a fire area.

  In its response to FM RAI.l (Reference 10), the licensee explained that transient combustibles are categorized as miscellaneous materials that do not contain combustible liquids (Group 3 and Group 4 of the GFMTs approach). The licensee stated that it does not differ in any significant manner from other plants with respect to its transient combustible controls to warrant a significant increase or decrease of the 98th percentile HRR of 317 kW recommended in NUREG/CR-6850. The licensee stated, however, that to address the potential for violations, a 69 kW peak HRR fire was applied in areas that have been designated as "no transient combustible areas."

  The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee demonstrated that the approach to categorize transient combustibles in terms of their nature and HRR characteristics is in accordance with the GFMTs approach and NRC-endorsed guidance and encompasses all typical plant configurations, and because the licensee identified a required action to incorporate appropriate transient controls into its FPP and included that action as an implementation item in LAR Attachment S, which would be required by the proposed license condition.

- In FM RAI 01.n (Reference 22), the NRC staff requested that the licensee justify why transient combustibles with an elevated fire base supported by a temporary structure were not considered.

  In its response to FM RAI 01.n (Reference 11), the licensee explained that the only likely ignition source associated with a temporary structure would be a faulted temporary electrical cable, and that the possibility of an energized temporary cable left unattended while in the proximity of transient combustibles on an elevated structure is highly unlikely. The licensee further stated that such

a configuration is not consistent with the transient fire frequency data specified in NUREG/CR-6850.

The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee provided adequate justification to not consider elevated transient fires supported by a temporary structure in the ZOI calculations.

- In FM RAI 01.o (Reference 22), the NRC staff requested that the licensee describe how the use of Flamastic fire retardant coating affected the cable tray fire propagation calculations.

  In its response to FM RAI 01.o (Reference 11), the licensee explained that the flame spread parameters for thermoset cables, as specified in NUREG/CR-6850, were used for thermoplastic cables coated with Flamastic and that damage of thermoplastic cables coated with Flamastic was still assumed to occur at the lower temperature and heat flux thresholds for thermoplastic cables.

  The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee explained that the cable tray fire propagation calculations used conservative values for thermoplastic cables coated with Flamastic fire retardant.

- In FM RAI 01.p (Reference 22), the NRC staff requested that the licensee explain how fire location effects were accounted for in the ZOI calculations for fires of electrical cabinets with vents within 2 feet of a wall or corner.

  In its response to FM RAI 01.p (Reference 11), the licensee explained that as a result of a walkdown, a small number of panel fire scenarios were identified for which panel vents are within 2 feet of a wall or corner. The licensee further stated that for these scenarios, a follow-up walkdown was performed to identify additional targets that would be damaged based on the ZOI for an HRR increased by a factor of two (for panels close to a wall) or four (for panels close to a corner) and that it updated the PRA accordingly. (See SE Section 3.4.2.2 for discussion regarding the licensee's response to PRA RAI 01.t.)

  The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee demonstrated that location effects for panel fires with vents in close proximity to a wall or corner have been properly accounted for.

- In FM RAI 01.q (Reference 22), the NRC staff requested that the licensee explain how transient fires involving secondary combustibles were modeled.

  In its response to FM RAI 01.q (Reference 11), the licensee explained that the HGL calculation and MCA treated secondary combustibles impacted by a transient ignition source in the same manner as secondary combustibles impacted by a 464 kW electrical panel ignition source. The licensee further stated that since this approach does not take into account the faster fire growth

rate of transient fires, the HGL calculations and MCA were updated based on the fire growth rates for transient fires recommended in FAQ 08-0052.

The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee demonstrated that transient fires involving secondary combustibles were modeled in accordance with NRC-endorsed guidance.

- In FM RAI 01.r (Reference 22), the NRC staff requested that the licensee explain how the results of the HGL analysis affect the ZOI calculations.

  In its response to FM RAI 01.r (Reference 11), the licensee explained that the GFMTs ZOI tables for thermoplastic cable targets were used without adjustment for HGL temperatures up to 80 °C and that for HGL temperatures between 80 °C and 131 °C, an expanded ZOI was obtained from the sensitive component tables in the GFMTs approach. The licensee further stated that HGL conditions were assumed for temperatures above 131 °C.

  The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee demonstrated that the approach used to adjust the ZOI to account for an elevated HGL temperature is conservative.

- In FM RAI 01.s (Reference 22), the NRC staff requested that the licensee describe how the height of an ignition source was determined.

  In its response to FM RAI 01.s (Reference 11), the licensee stated that the fire height for electrical panel ignition sources was postulated 1 foot below the cabinet top, consistent with guidance from FAQ 08-0043 (Reference 77), and that the fire height for transient ignition sources was postulated at the floor level as discussed in the response to FM RAI 01.n.

  The NRC staff concludes that the licensee's response the RAI is acceptable because the licensee demonstrated that the assumptions used for electrical panel and transient ignition sources are in accordance with NRC-endorsed guidance.

- In FM RAI 01.t (Reference 22), the NRC staff requested that the licensee explain how non-cable intervening combustibles were identified and accounted for in the FM analysis.

  In its response to FM RAI 01.t (Reference 11), the licensee explained that additional walkdowns were performed of the accessible zones and areas to identify non-cable intervening combustibles, and that none were found that would adversely impact the FM analysis. The licensee further stated that except in the containment, full room burnout was assumed in the zones that were inaccessible, and intervening combustibles are, therefore, not an issue in these zones.

The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee demonstrated that the potential contribution of non-cable intervening combustibles was accounted for appropriately in the FM analysis.

- During the audit, the NRC staff found that a location factor of two was applied for a transient fire in a corner of the CSR. In FM RAI 01.u (Reference 22), the NRC staff requested that the licensee provide technical justification for not applying a location factor of four for this fire scenario.

  In its response to FM RAI 01.u (Reference 11), the licensee explained that a review of all ZOI calculations in the CSR revealed that location factor adjustments were applied correctly for all corner fire scenarios, except scenario 098-S1. The licensee further stated that it recalculated the ZOI for this scenario with a location factor of four, and determined that this would lead to damage of seven additional targets. The licensee updated the FPRA (see discussion of PRA RAI 01.t in SE Section 3.4.2.2), and the results were provided by the licensee separately (see (Reference 12)).

  The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee demonstrated that location factors were applied correctly except in one scenario, and for that scenario, the licensee recalculated the ZOI using the appropriate location factor, and updated the FPRA accordingly.

- In FM RAI 02.a (Reference 22), the NRC staff requested that the licensee describe how the installed cabling in the power block was characterized, specifically with regard to the critical damage threshold temperatures and critical heat flux for thermoset and thermoplastic cables as described in NUREG/CR-6850.

  In its response to FM RAI 02.a (Reference 10), the licensee stated that all the cable targets are assumed to have thermoplastic temperature (205 °C) and heat flux of (6 kW/m^2) damage thresholds.

  The NRC staff concludes that the licensee's response to the RAI is acceptable because the damage thresholds for thermoplastic cable targets are lower than those for thermoset cables.

- In FM RAI 02.c (Reference 22), the NRC staff requested that the licensee confirm that the ZOI tables in the GFMTs approach for "IEEE-383 qualified" targets were not applied to cables with thermoplastic damage thresholds as defined in NUREG/CR-6850.

  In its response to FM RAI 02.c (Reference 10), the licensee stated that all cable targets are assumed to have thermoplastic damage thresholds and that the GFMTs approach tables for non-IEEE-383 qualified cables were used to determine the ZOI.

The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee used the most conservative tables in the GFMTs approach to determine the ZOI.

- In FM RAI 02(d) (Reference 22), the NRC staff requested that the licensee explain how the damage thresholds for non-cable components were determined, and to identify non-cable components that were assigned damage thresholds different from those for thermoset and thermoplastic cables.

  In its response to FM RAI 02(d) (Reference 10), the licensee stated that thermoplastic damage thresholds were used for all non-cable components.

  The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee's approach for assigning thermoplastic damage thresholds to non-cable components follows the guidelines in NRC-endorsed guidance.

- In FM RAI 02.e (Reference 22), the NRC staff requested that the licensee provide technical justification for applying the damage criteria for thermoplastic cables to sensitive electronics inside an enclosure.

  In its response to FM RAI 02.e (Reference 12), the licensee stated that it based its assumption on the guidance in NRC FAQ 13-0004 (Reference 125). In FM RAI 02.01 (Reference 23), the NRC staff requested that the licensee re-assess the treatment of sensitive electronics based on the guidance in the final version of the FAQ 13-0004. In its response to FM RAI 02.01 (Reference 13), the licensee explained that an additional walkdown did not identify any exposed sensitive electronics susceptible to fire damage, and the damage criteria used for sensitive electronics in an enclosure are more conservative than the guidance provided in the final version of FAQ 13-0004.

  The NRC staff concludes that the licensee's responses to the RAIs are acceptable because the licensee demonstrated the use of more conservative damage criteria for sensitive electronics in enclosures than that provided in NRC-endorsed guidance.

3.4.2.3.3 Conclusion for Section 3.4.2.3

Based on the licensee's description in the LAR, as supplemented, of the process for performing FM in support of the FREs and clarifications provided in response to the RAIs, the NRC staff concludes that the licensee's approach for meeting the requirements of NFPA 805, Section 2.4.3.3 is acceptable.

3.4.2.4. Conclusions Regarding Fire PRA Quality

Based on NUREG-0800, Section 19.2 (Reference 49), Section III.2.2.4.1, summarizing the NRC staff's review of PRA Quality required for an LAR, the NRC staff concludes that the licensee's PRA satisfies the guidance in RG 1.174, Section 2.3 and RG 1.205, Section 4.3 regarding the technical adequacy of the PRA used to support risk assessment for transition to NFPA 805.

The FPRA methods used to support the LAR were evaluated by the NRC staff in SE Section 3.4.2.2, and the NRC staff did not accept some of the methods proposed by the licensee. FPRA methods that are not accepted by the NRC are not considered alternatives to NRC accepted codes and standards. In all but one case, the licensee removed the method from the PRA or demonstrated that the method did not impact its ability to meet the risk acceptance guidelines of RG 1.174. In one case related to modelling CSR fires in the compliant plant PRA model discussed in the evaluation of the licensee's response to PRA RAI 13.01 in SE, Section 3.4.2.2, the NRC determined that the method did not impact the licensee's ability to meet the transition risk acceptance guidelines and that the modelling in the post-transition PRA is acceptable.

The NRC staff concludes that the PRA approach, methods, and data are acceptable, and that NFPA 805, Section 2.4.3.3 is satisfied for transition to NFPA 805. The NRC staff based this conclusion on the findings that (1) the PRA model meets the criteria in that it adequately represents the current, as-built, as-operated configuration, and is, therefore, capable of being adapted to model both the post-transition and compliant plant as needed; (2) the PRA model conforms sufficiently to the applicable industry PRA standards for internal events and fires at an appropriate CC, considering the acceptable disposition of the peer review and NRC staff review findings; and (3) the FM used to support the development of the FPRA has been confirmed as appropriate and acceptable.

The FPRA used to support RI self-approval of changes to the FPP must use an acceptable PRA approach and acceptable methods and data. The NRC staff concludes that the changes already made to the baseline FPRA model to incorporate acceptable methods, as detailed in the licensee's responses to PRA RAI 29, (Reference 14) and (Reference 17), and discussed above, demonstrate that NFPA 805 criteria are satisfied and the PRA is acceptable for use to support self-approval changes to the FPP program.

Finally, based on the licensee's administrative controls to maintain the PRA models current and assure continued quality, using only qualified staff and contractors (as described in SE Section 3.8.3), the NRC staff concludes that the PRA maintenance process can assure that the quality of the PRA is sufficient to support self-approval of future RI changes to the FPP under the NFPA 805 license condition, subject to completion of all implementation items described in LAR Attachment S, Table S-3.

3.4.3 Fire Risk Evaluations

For those fire areas that the licensee used a PB approach to meet the NSPC, the licensee used FREs in accordance with NFPA 805, Section 4.2.4.2 to demonstrate the acceptability of the plant configuration. In accordance with the guidance in RG 1.205, Section C.2.2.4, "Risk Evaluations," the licensee used an RI approach to justify acceptable alternatives to comply with the deterministic criteria of NFPA 805. The NRC staff reviewed the following information during its evaluation of the licensee's FREs: LAR Section 4.5.2, "Performance Based Approaches"; LAR Attachment C, "NEI 04-02, Table B-3 -Fire Area Transition"; and LAR Attachment W, "Fire PRA Risk Insights"; as well as associated supplemental information.

Plant configurations that did not meet the deterministic requirements of NFPA 805, Section 4.2.3.1 were considered VFDRs. VFDRs that will be brought into deterministic

compliance through plant modifications need no risk evaluation. In LAR Attachment C, "NEI 04-02, Table B-3 – Fire Area Transition," the licensee identified the VFDRs that it does not intend to bring into deterministic compliance under NFPA 805. For these VFDRs, the licensee performed evaluations using the RI approach, in accordance with NFPA 805, Section 4.2.4.2 to address FPP non-compliances and to demonstrate that the VFDRs are acceptable.

All of the VFDRs identified by the licensee were categorized as separation issues. The VFDRs can generally be categorized into the following three types of plant configurations: (1) inadequate separation resulting in fire-induced damage of process equipment or associated cables required for the identified success path; (2) inadequate separation resulting in fire-induced spurious operation of equipment that may defeat the identified success path; (3) inadequate separation resulting in fire-induced failure of process monitoring instrumentation or associated cables required for the identified success path; or (4) combinations of the above configurations. Additionally, in its response to PRA RAI 15 (Reference 10), the licensee stated that none of the VFDRs involved PB evaluations of wrapped or embedded cables, and any such cables were credited in the FPRA as being protected from fire damage, commensurate with engineering evaluations.

In its responses to PRA RAI 13 (Reference 10), PRA RAI 13.01 (Reference 14), and PRA RAI 13.02 (Reference 14), the licensee summarized how an FRE is, in general, performed for a VFDR. Each VFDR is reviewed to ensure that it is adequately reflected in the FPRA model. The variant case is with the VFDR present, and the compliant case removes the VFDR to represent a deterministically compliant condition. This is accomplished by treating basic events in the FPRA model associated with components related to a VFDR as if they were unaffected by fire. The change in risk associated with each fire area is then obtained by calculating the difference between the CDF and LERF of the compliant plant configuration and the variant, or post-transition, plant configuration. For those VFDRs that are considered to have no or an insignificant change in risk based on qualitative evaluation, the change in risk, as discussed in the licensee's response to PRA RAI 13.01 (Reference 14), is not estimated with the PRA, but rather designated as having negligible or no impact. The licensee obtained the total change in risk by summing the change in risk for each fire area and comparing the total for each unit to the RG 1.174 acceptance guidelines.

The NRC staff concludes that the licensee's methods for calculating the change in risk associated with VFDRs are acceptable because they are consistent with RG 1.205, Section 2.2.4.1 and FAQ 08-0054. The NRC staff further concludes that the results of these calculations for each fire area, which are summarized in LAR Attachment W, Tables W-6 and W-7, as supplemented, demonstrate that the difference between the risk associated with implementation of the deterministic requirements and that of the VFDRs meet the risk acceptance criteria described in NFPA 805, Section 2.4.4.1.

3.4.4 Additional Risk Presented by Recovery Actions

The NRC staff reviewed LAR Attachment C, "NEI 04-02, Table B-3 – Fire Area Transition"; LAR Attachment G, "Recovery Actions Transition"; and LAR Attachment W, "Fire PRA Insights", during its evaluation of the additional risk presented by the NFPA 805 RAs at Turkey Point. SE Section 3.2.5 describes the identification and evaluation of RAs.

The licensee used the guidance in RG 1.205, Revision 1 for addressing RAs. This included consideration of the definition of PCS and RA as clarified in RG 1.205, Revision 1. Accordingly, any actions required to transfer control to, or operate equipment from, the PCS, while required as part of the RI/PB FPP, were not considered RAs per the RG 1.205 guidance and in accordance with NFPA 805. Conversely, any OMAs required to be performed outside the control room and not at the PCS were considered RAs.

The licensee identified the RAs in LAR Attachment G, Table G-1 and indicated which RAs are credited for risk reduction and which RAs are required for DID only. Operator actions performed at the PCS following MCR abandonment are identified in LAR Attachment G, Table G-1 but, as explained above, they are not considered RAs. The licensee further explained in the LAR that not all RAs listed in LAR Attachment G are modeled specifically in the PRA using HRA. The reliability of these uncredited RAs are considered to be bounded by the delta risk of the associated VFDRs. As indicated in LAR Attachment W, Tables W-6 and W-7, the total additional risk of RAs and additional risk of RAs for each fire area with either risk-reduction or DID RAs are conservatively assumed to be equal to the total delta risk and delta risk for each fire area, respectively. As indicated in LAR Attachment W, Tables W-6 and W-7, the additional risk of RAs is estimated as the risk associated with cutsets containing RAs for each fire area. The sum of these cutsets is a bounding value for the risk reduction associated with the elimination of the RAs.

The updated LAR Attachment W (Reference 17) and (Reference 19), provides the additional risk of RAs for Units 3 and 4 as 7.42E-07/year and 5.33E-06/year for CDF, respectively, and 3.64E-07/year and 1.17E-07/year for LERF, respectively. These values are below the change-in-risk acceptance guidelines in RG 1.174. RG 1.205 Position 2.2.4.2 states that the RG 1.174 guidelines are also applicable to the additional risk of RAs. Additionally, the additional risk of RAs in each area is also below the RG 1.174 acceptance guidelines.

In LAR Attachment G, the licensee indicated that it reviewed all of the RAs for adverse impact on plant risk per FAQ 07-0030 (Reference 71), and stated that no RAs listed in LAR Attachment G, Table G-1 were found to have an adverse impact. Furthermore, all RAs listed in LAR Attachment G were evaluated against the feasibility criteria provided in NEI 04-02, FAQ 07-0030, and RG 1.205. The licensee included an action in LAR Attachment S, Table S-3, Implementation Item 13, to update the post-fire shutdown procedures and associated operator training to incorporate updated NSCA strategies, which include the results of the RA feasibility evaluation. The NRC staff concludes that this action is acceptable because it will incorporate the provisions of NFPA 805 in the FPP and would be required by the proposed license condition.

The NRC staff concludes that the licensee's methods for determining the additional risk of RAs are acceptable because they are consistent with RG 1.205, Section 2.2.4.1 and FAQ 07-0030. Furthermore, the estimated values are less than the acceptance guidelines, and the NRC, therefore, concludes that the additional risk of RAs meets the requirements of NFPA 805, Sections 2.4.4.1 and 4.2.4.

3.4.5 Risk-Informed or Performance-Based Alternatives to Compliance with NFPA 805

The licensee did not use any RI or PB alternatives to meet compliance with NFPA 805.

3.4.6 Cumulative Risk and Combined Changes

The licensee elected to retain a number of VFDRs that will increase risk compared to a compliant plant. In LAR Attachment S, Table S-2, the licensee included modifications, which removed some VFDRs, and other modifications that were not needed to bring the facility into compliance with the deterministic requirements of NFPA 805. Therefore, the NRC staff concludes that the licensee's LAR to transition to an RI/PB FPP is a combined change request per RG 1.174, Revision 2, Section 1.1. The licensee credited the risk reduction modifications in both the post-transition risk and the compliant plant risk in the change-in-risk estimates in LAR Attachment W, but provided separate estimates of the risk-reduction achieved by the modifications. The NRC staff concludes that this information is consistent with the combined change request guidance in RG 1.174 in that the risk increase and risk decrease be reported separately.

The total CDF and total LERF are estimated by adding the risk assessment results for internal events, internal flood, fire, seismic, and other external events. RG 1.174 does not require total CDF and LERF estimates when the increase in CDF and LERF are estimated to be less than 1E-6/year and 1E-7/year, respectively. Although the licensee estimates a net risk decrease in the transition to an RI/PB FPP, the licensee provided an estimate of the total post-transition CDF and LERF in LAR Attachment W (Reference 17). The estimated total risk values are 8.86E-05/year and 5.45E-06/year for CDF and LERF, respectively, for Unit 3, and 8.10E-05/year and 4.98E-06/year for CDF and LERF, respectively, for Unit 4. For these total risk estimates, the RG 1.174 acceptance guidelines for an acceptable risk increase are 1.0E-05/year and 1.0E-06/year for CDF and LERF, respectively.

In its response to PRA RAI 29 (Reference 14) and (Reference 17), the licensee provided a supplement to LAR Attachment W that reports change-in-risk estimates based on the PRA after implementing a number of PRA model and method refinements to use NRC-accepted methods. In LAR Attachment W, Tables W-6 and W-7, the licensee reported change-in-risk values for each fire area, and a total change-in-risk value of 4.12E-05/year and 2.21E-06/year for CDF and LERF, respectively, for Unit 3, and 3.22E-05/year and 1.50E-06/year for CDF and LERF, respectively, for Unit 4. All the change-in-risk estimates include the risk reduction modifications in both the variant and the compliant risk estimates and are, therefore, a measure of the risk increase associated with the retained VFDRs, not the change-in-risk associated with transition to NFPA 805. As a separate entry in the tables, the licensee reported the risk reduction achieved by removing the risk-reduction modifications from the compliant plant, which provides the estimate of risk-reduction achieved from the risk-reduction modifications. The reported values are -2.13E-04/year and -9.33E-6/year for CDF and LERF, respectively, for Unit 3, and -1.94E-04/year and -6.51-06/year for CDF and LERF, respectively, for Unit 4.

The combined change request discussed in RG 1.174 allows the risk-increase and the risk-decrease to be combined and the net change to be compared to the RG 1.174 acceptance guidelines. Therefore, the total risk increase from the retained VFDRs can be combined with

risk decrease resulted from the risk-reduction modifications to estimate the net change in risk associated with transition to NFPA 805. In the tables, the licensee stated that the "[t]otal Delta CDF and LERF with risk reduction credit" is less than zero for both units, but did not provide a net change-in-risk estimate. The NRC staff did not identify any correlations or synergistic relationship between the reported values and obtained the net change in risk for transition by summing the retained VFDRs risk increase and risk decrease associated with the risk-reduction modifications. This calculation yields a net NFPA 805 transition change in risk of -1.72E-04/year and -7.06E-06/year for CDF and LERF, respectively, for Unit 3, and -1.62E-04/year and -5.06E-06/year for CDF and LERF, respectively, for Unit 4. These values are consistent with the licensee statement that the change in risk is less than zero and indicate a substantial risk reduction resulted from implementing the modifications associated with the transition to NFPA 805. The change-in-risk estimates for the cable spreading room in in each unit slightly exceed the acceptance guidelines. The primary change-in-risk measure is, however, the total change in risk, which demonstrates a substantial net risk decrease, and therefore, the NRC staff finds that slightly exceeding the guidelines in the two fire areas is acceptable.

Based on the information above, the NRC staff concludes that the risk associated with the proposed alternatives to compliance with the deterministic criteria of NFPA 805 meets the acceptance guidelines in RG 1.174 and is acceptable in accordance with NFPA 805, Section 2.4.4.1. Additionally, the NRC staff concludes that the licensee has satisfied RG 1.174, Section 2.4 and NUREG-0800, Section 19.2 regarding acceptable risk.

3.4.7 Uncertainty and Sensitivity Analyses

The licensee evaluated key sources of uncertainty and sensitivity in response to a number of RAIs.

In PRA RAI 27.e.01 (Reference 24), the NRC staff requested that the licensee assess the impact on the NFPA 805 application of those IEPRA sources of model uncertainty and related assumptions identified as relevant to the FPRA. In its response to PRA RAI 27.e.01 (Reference 14), the licensee performed a review of the IEPRA uncertainty evaluation, which is consistent with the guidance of NUREG-1855 (Reference 59); identified the key sources of uncertainty for the FPRA; and concluded that none of identified sources has a significant impact on the FPRA. As discussed in its response to PRA RAI 01.d (Reference 10) and PRA RAI 01.d.01 (Reference 14), the licensee performed a similar review for the Turkey Point Level 2 IEPRA. The NRC staff finds this qualitative and conservative treatment of modeling uncertainty acceptable because the licensee performed the assessment consistent with the guidance in NUREG-1855, and did not identify any sources of uncertainty as having a significant impact on the FPRA.

In the response to RAI 01.t (Reference 12), the licensee stated that the then current risk values were based on the baseline ignition frequencies in NUREG/CR-6850 but also referred to the "possible use" of the alternative fire frequencies in Supplement 1 to NUREG/CR-6850. In the same RAI response, the licensee referred to the "required sensitivity analysis when using Supplement 1 ignition frequency data." The licensee subsequently reported no deviation from these accepted methods and therefore the NRC concludes that either the baseline frequencies in NUREG/CR-6850 were retained or the Supplement 1 frequencies were used and the sensitivity study was successfully performed and completed as described in Supplement 1.

3.4.8 Conclusion for Section 3.4

Based on the information provided by the licensee in the LAR, as supplemented, regarding the fire risk assessment methods, tools, and assumptions used to support transition to NFPA 805, the NRC staff concludes that:

- The licensee's PRA used to perform the risk assessments in accordance with NFPA 805, Section 2.4.4 (plant change evaluations) and Section 4.2.4.2 (FREs), is of sufficient quality to support the application to transition to NFPA 805. The NRC staff concludes that the PRA approach, methods, tools, and data are acceptable and are in accordance with NFPA 805, Section 2.4.3.3.

- The licensee stated that it has completed the changes to the baseline FPRA model, which replaces unacceptable approaches, data, and methods identified during the LAR review with acceptable approaches, data, and methods as described. Therefore, the NRC staff finds that the FPRA model may be used to support post-transition self-approval of changes because the identified acceptable methods will be used unless replaced by other acceptable methods.

- LAR Attachment S, Table S-3, Implementation Item 18, adequately addresses the complexity of PRA modeling of proposed modifications because it states that after completing the transition to NFPA 805, the licensee will re-assess the risk and the change-in-risk results against the estimates provided in the LAR, as supplemented, and will treat this assessment as a post-transition change evaluation.

- LAR Attachment S, Table S-3, Implementation Item 22, is acceptable because it states that the licensee will evaluate the change in risk associated with replacing the current Flowserve RCP seal model with an acceptable model when one becomes available, and will take action to reduce risk results if any risk increase from this replacement exceeds the self-approval risk guidelines.

- The licensee's PRA maintenance process is adequate to support self-approval of future RI changes to the FPP subject to completion of LAR Attachment S, Table S-3, Implementation Items 13, 16, 17, and 18.

- The transition process included a detailed review of fire protection DID and safety margins as required by NFPA 805. The NRC staff finds the licensee's documentation of DID and safety margins to be acceptable. The licensee's process followed the NRC-endorsed guidance in NEI 04-02, Revision 2 and is consistent with the approved NRC staff guidance in RG 1.205, Revision 1, which provides an acceptable approach for meeting the requirements of 10 CFR 50.48(c).

- The licensee's application to transition to NFPA 805 is a combined change that includes risk increases from retained VFDRs and risk decreases resulting from non-VFDR related modifications. Based on the combination of these risk values,

the changes in risk (i.e., ΔCDF and ΔLERF) associated with the proposed alternatives to compliance with the deterministic criteria of NFPA 805 (FREs) are acceptable. The licensee satisfied the guidance contained in RG 1.205, Revision 1, RG 1.174, Section 2.4, and NUREG-0800, Section 19.2 regarding acceptable risk. By meeting the guidance contained in these approved documents, the changes in risk are found to be acceptable to the NRC staff.

- The licensee determined and provided the risk associated with the use of RAs in accordance with NFPA 805, Section 4.2.4 and the guidance in RG 1.205, Revision 1. The NRC staff concluded that the additional risk associated with the NFPA 805 RAs is acceptable because the risk for each fire area that relies on an RA is below the acceptance guidelines in RG 1.174, and therefore, meets the acceptance criteria in RG 1.205, Revision 1.

- The licensee did not utilize any RI or PB alternatives to meet compliance with NFPA 805, which fall under the requirements of 10 CFR 50.48(c)(4).

3.5 Nuclear Safety Capability Assessment Results

NFPA 805 (Reference 3), Section 2.2.3, "Evaluating Performance Criteria," states:

> To determine whether plant design will satisfy the appropriate performance criteria, an analysis shall be performed on a fire area basis, given the potential fire exposures and damage thresholds, using either a deterministic or performance-based approach.

NFPA 805, Section 2.2.4, "Performance Criteria," states:

> The performance criteria for nuclear safety, radioactive release, life safety, and property damage/business interruption covered by this standard are listed in Section 1.5 and shall be examined on a fire area basis.

NFPA 805, Section 2.2.7, "Existing Engineering Equivalency Evaluations," states:

> When applying a deterministic approach, the user shall be permitted to demonstrate compliance with specific deterministic fire protection design requirements in Chapter 4 for existing configurations with an engineering equivalency evaluation. These existing engineering evaluations shall clearly demonstrate an equivalent level of fire protection compared to the deterministic requirements.

3.5.1 Nuclear Safety Capability Assessment Results by Fire Area

NFPA 805, Section 2.4.2, "Nuclear Safety Capability Assessment," states:

> The purpose of this section is to define the methodology for performing a nuclear safety capability assessment. The following steps shall be performed:

(1) Selection of systems and equipment and their interrelationships necessary to achieve the nuclear safety performance criteria in Chapter 1;

(2) Selection of cables necessary to achieve the nuclear safety performance criteria in Chapter 1;

(3) Identification of the location of nuclear safety equipment and cables; and

(4) Assessment of the ability to achieve the nuclear safety performance criteria given a fire in each fire area.

This SE section addresses the last topic regarding the ability of each fire area to meet the NSPC of NFPA 805. SE Section 3.2.1 addresses the first three topics.

NFPA 805, Section 2.4.2.4, "Fire Area Assessment," states:

> An engineering analysis shall be performed in accordance with the requirements of Section 2.3 for each fire area to determine the effects of fire or fire suppression activities on the ability to achieve the nuclear safety performance criteria of Section 1.5.

In accordance with the above, the process defined in NFPA 805, Chapter 4 provides a framework to select either a deterministic or a PB approach to meet the NSPC. Within each of these approaches, additional requirements and guidance provide the information necessary for the licensee to perform the engineering analyses necessary to determine which fire protection systems and features are required to meet the NSPC of NFPA 805.

NFPA 805, Section 4.2.2, "Selection of Approach," states:

> For each fire area either a deterministic or performance-based approach shall be selected in accordance with Figure 4.2.2. Either approach shall be deemed to satisfy the nuclear safety performance criteria. The performance-based approach shall be permitted to utilize deterministic methods for simplifying assumptions within the fire area.

This SE section evaluates the approach used to meet the NSPC on a fire area basis, as well as what fire protection features and systems are required to meet the NSPC.

The NRC staff reviewed LAR (Reference 8) Section 4.2.4, "Fire Area Transition"; LAR Section 4.8.1, "Results of the Fire Area Review"; LAR Attachment C, Table C-1, "NFPA 805 Ch 4 Compliance (NEI 04-02, Table B-3)"; LAR Attachment G, "Recovery Actions Transition"; LAR Attachment S, "Plant Modifications and Items to be Completed During Implementation"; and LAR Attachment W, "Fire PRA Insights," during its evaluation of the ability of each fire area to meet the NSPC of NFPA 805.

Turkey Point is a dual unit PWR with 93 individual fire areas, including the Yard, that primarily consists of outside areas identified as Fire Area OD subdivided into 37 fire zones. Each fire

area is composed of one or more fire zones. Based on the information provided by the licensee in the LAR, as supplemented, the licensee performed the NSCA on a fire area basis, and on a fire zone basis for areas identified as fire area OD, as shown in LAR Attachment C for each unit. LAR Attachment C, Table C-1, "NFPA 805 Ch 4 Compliance (NEI 04-02, Table B-3)," provides the results of these analyses on a fire area basis for each unit and also identifies the fire zones within the fire areas.

SE Table 3.5-1 identifies those fire areas that were analyzed using either the deterministic or PB approach in accordance with NFPA 805, Chapter 4 based on the information provided in LAR Attachment C, Table C-1, "NFPA 805 Ch 4 Compliance (NEI 04-02, Table B-3)."

Table 3.5-1: Fire Area and Compliance Strategy Summary

Fire Area	Description	Compliance Strategy
U3-A	Aux Building (Elev. 18 ft. and below), Fire Zones 4, 5, 6, 7, 8, 9, 10, 17, and 18	Performance Based
U3-AA	Unit 3 Train B EDG Day Tank Room	Deterministic
U3-AAA	Units 3 and 4 Miscellaneous Zones	Performance Based
U3-B	Unit 3 RHR: Heat Exchanger, Pump A & B Rooms	Performance Based
U3-BB	Unit 3 Train A EDG Day Tank Room	Deterministic
U3-BBB	Units 3 and 4 Safety Injection Pump Rooms	Deterministic
U3-C	Unit 4 RHR: Heat Exchanger, Pump A & B Rooms	Performance Based
U3-CC	Units 3 and 4 Aux Building NS Breezeway	Performance Based
U3-CCC	Units 3 and 4 Vestibule Elevator	Deterministic
U3-D	Unit 4 Pipe and Valve Room	Performance Based
U3-DD	Unit 4 480V Load Centers A and B Room	Performance Based
U3-DDD	Unit 4 Steam Generator Feed Pump Area	Deterministic
U3-E	Unit 3 Pipe and Valve Room	Performance Based
U3-EE	Unit 4 480V Load Centers C and D Room	Deterministic
U3-EEE	Unit 3 Steam Generator Feed Pump Area	Deterministic
U3-F	Aux Building (Elevation 18 ft.)	Performance Based
U3-FF	Unit 3 480V Load Centers A and B Room	Performance Based
U3-FFF	Purge Supply Fan Room	Performance Based
U3-G	Units 3 and 4 Electrical Equipment Room and Spare Battery Room	Performance Based
U3-GG	Unit 3 480V Load Centers C and D Room	Performance Based
U3-H	Unit 3 West Electrical Penetration Room	Performance Based
U3-HH	Units 3 and 4 Cable Spreading Room	Performance Based
U3-I	Unit 3 South Electrical Penetration Room	Performance Based
U3-II	Unit 4 B DC Equipment Room	Performance Based
U3-J	Unit 4 North Electrical Penetration Room	Deterministic
U3-JJ	Unit 4 Battery Rack B Room	Performance Based
U3-K	Unit 4 West Electrical Penetration	Deterministic
U3-KK	Unit 3 Battery Rack A Room	Performance Based
U3-L	Units 3 and 4 Aux Building Fan Room	Performance Based
U3-LL	Unit 3 A DC Equipment Room	Performance Based
U3-MM	Units 3 and 4 Control Room Complex	Performance Based
U3-N	Unit 4 Charging Pump Room	Performance Based
U3-NN	4A DC Equipment Room	Performance Based
U3-O	Boric Acid Tanks and Pump Room/Unit 3 Charging Pump Room	Performance Based
U3-OD-047	Unit 4 CCW Pump and Heat Exchanger	Performance Based
U3-OD-054	Unit 3 CCW Pump and Heat Exchanger Area	Performance Based
U3-OD-076	Unit 4 Turbine Lube Oil Reservoir Area	Deterministic
U3-OD-077	Unit 4 Laydown Area, Instrument Air Compressors and Condensate Storage Area	Performance Based

U3-OD-078	Unit 4 Instrument Air Equipment Area	Performance Based
U3-OD-079	Outdoor Area West of Unit 4 Containment	Performance Based
U3-OD-080	Unit 4 Main Condenser Area	Performance Based
U3-OD-081	Unit 4 Main and Startup Transformers and Unit 3 Turbine Lube Oil Reservoir Area	Performance Based
U3-OD-082	Unit 4 Aux Transformer Area	Performance Based
U3-OD-083	Unit 3 Instrument Air Equipment Area	Performance Based
U3-OD-084	Units 3 and 4 Aux Feedwater Pump Area	Performance Based
U3-OD-085	Unit 3 Main Condenser Area	Performance Based
U3-OD-086	Unit 3 Main and Startup Transformer Area	Performance Based
U3-OD-087	Unit 3 Aux Transformer Area	Performance Based
U3-OD-088	Unit 3 Switchgear/Diesel Generator Vestibule	Performance Based
U3-OD-089	Unit 3 Condensate Storage Tank Area	Performance Based
U3-OD-090	Unit 3 EDG Oil Storage Tank Area	Performance Based
U3-OD-091	Unit 4 Condensate Pump Area	Performance Based
U3-OD-092	Unit 3 Condensate Pump Area	Performance Based
U3-OD-105	Units 3 and 4 Turbine Building Mezzanine Deck	Performance Based
U3-OD-113	Unit 4 Feedwater Platform	Performance Based
U3-OD-114	Unit 4 Main Steam Header Platform	Performance Based
U3-OD-115	Unit 3 Main Steam Header Platform	Performance Based
U3-OD-116	Unit 3 Feedwater Platform	Performance Based
U3-OD-117	Units 3 and 4 Turbine Deck	Performance Based
U3-OD-118	Units 3 and 4 Aux Building Roof	Performance Based
U3-OD-122	Units 3 and 4 Water Treatment Plant & Area East	Performance Based
U3-OD-123	Units 3 and 4 Refueling Water Storage Tank Area	Performance Based
U3-OD-124	Outside Area NE of Unit 3 Containment	Performance Based
U3-OD-125	Land Area South of Unit 4 Containment	Performance Based
U3-OD-128	Units 3 and 4 Distribution Switchyard	Performance Based
U3-OD-131	Units 3A and 3B EDG Radiator Room	Performance Based
U3-OD-143	Unit 3 EDG Roof	Performance Based
U3-OD-999	Miscellaneous Areas	Performance Based
U3-OD-Intake	Units 3 and 4 Circulating Water Intake Structure and Intake Laydown Area	Performance Based
U3-OO	Units 3 and 4 B DC Equipment Room	Performance Based
U3-P	Unit 4 Containment Building	Deterministic
U3-PP	Unit 4 Battery Rack A Room	Performance Based
U3-Q	Unit 3 Containment Building	Performance Based
U3-QQ	Unit 3 Battery Rack B Room	Performance Based
U3-R	Unit 4 Reactor Control Rod Equipment Room	Deterministic
U3-RR	Unit 4 EDG Train A Room	Deterministic
U3-S	Units 3 and 4 Computer Room	Performance Based
U3-SS	Unit 4 Train B EDG Room	Deterministic
U3-T	Unit 3 Reactor Control Rod Equipment Room	Performance Based
U3-TT	Unit 3 Switchgear Room 3D	Deterministic
U3-U	Unit 4 4160V Switchgear 4B Room	Performance Based
U3-UU	Unit 4 Switchgear Room 4D	Deterministic

U3-V	Unit 4 4160V Switchgear 4A Room	Performance Based
U3-VV	Unit 4 Train A EDG Control Room	Deterministic
U3-W	Unit 3 4160V Switchgear 3B Room	Performance Based
U3-WV	Unit 4 Train A Diesel Oil Pump Room & Diesel Oil Storage Tank (Zones 141 and 142)	Deterministic
U3-X	4160V Switchgear 3A Room	Performance Based
U3-XX	Unit 4 Train B Diesel Oil Transfer Pump Room & Diesel Oil Storage Tank (Zones 136 and 137)	Deterministic
U3-Y	Unit 3 Train B EDG Building	Performance Based
U3-YY	Unit 4 Train B EDG Building	Deterministic
U3-Z	Unit 3 Train A EDG Building	Performance Based
Unit 4		
U4-A	Aux Building (Elev. 18 ft. and below), Fire Zones 4, 5, 6, 7, 8, 9, 10, 17, and 18	Performance Based
U4-AA	Unit 3 Train B EDG Day Tank Room	Deterministic
U4-AAA	Units 3 and 4 Miscellaneous Zones	Performance Based
U4-B	Unit 3 RHR: Heat Exchanger; Pump A & B Rooms	Performance Based
U4-BB	Unit 3 Train A EDG Day Tank Room	Deterministic
U4-BBB	Units 3 and 4 Safety Injection Pump Rooms	Deterministic
U4-C	Unit 4 RHR Heat Exchanger; Pump A & B Rooms	Performance Based
U4-CC	Units 3 and 4 Aux Building North-South Breezeway	Performance Based
U4-CCC	Units 3 and 4 Vestibule Elevator	Deterministic
U4-D	Unit 4 Pipe and Valve Room	Performance Based
U4-DD	Unit 4 480V Load Centers A and B Room	Performance Based
U4-DDD	Unit 4 Steam Generator Feed Pump Area	Deterministic
U4-E	Unit 3 Pipe and Valve Room	Performance Based
U4-EE	Unit 4 480V Load Centers C and D Room	Performance Based
U4-EEE	Unit 3 Steam Generator Feed Pump Area	Deterministic
U4-F	Aux Building (Elevation 18 ft. 0 inches)	Performance Based
U4-FF	Unit 3 480V Load Centers A and B Room	Deterministic
U4-FFF	Purge Supply Fan Room	Performance Based
U4-G	Units 3 and 4 Electrical Equipment Room and Spare Battery Room	Performance Based
U4-GG	Unit 3 480V Load Centers C and D Room	Performance Based
U4-H	Unit 3 West Electrical Penetration Room	Deterministic
U4-HH	Units 3 and 4 Cable Spreading Room	Performance Based
U4-I	Unit 3 South Electrical Penetration Room	Deterministic
U4-II	Unit 4 B DC Equipment Room	Performance Based
U4-J	Unit 4 North Electrical Penetration Room	Performance Based
U4-JJ	Unit 4 Battery Rack B Room	Performance Based
U4-K	Unit 4 West Electrical Penetration Room	Performance Based
U4-KK	Unit 3 Battery Rack A Room	Deterministic
U4-L	Units 3 and 4 Aux Building Fan Room	Performance Based
U4-LL	Unit 3 A DC Equipment Room	Deterministic
U4-MM	Units 3 and 4 Control Room Complex	Performance Based
U4-N	Unit 4 Charging Pump Room	Performance Based

U4-NN	4A DC Equipment Room	Performance Based
U4-O	Boric Acid Tanks and Pump Room and Unit 3 Charging Pump Room	Performance Based
U4-OD-047	Unit 4 CCW Pump and Heat Exchanger Area	Performance Based
U4-OD-054	Unit 3 CCW Pump and Heat Exchanger Area	Deterministic
U4-OD-076	Unit 4 Turbine Lube Oil Reservoir Area	Performance Based
U4-OD-077	Unit 4 Laydown Area, Instrument Air Compressors and Condensate Storage Area	Performance Based
U4-OD-078	Unit 4 Instrument Air Equipment Area	Performance Based
U4-OD-079	Outdoor Area West of Unit 4 Containment	Performance Based
U4-OD-080	Unit 4 Main Condenser Area	Performance Based
U4-OD-081	Unit 4 Main and Startup Transformers and Unit 3 Turbine Lube Oil Reservoir Area	Performance Based
U4-OD-082	Unit 4 Aux Transformer Area	Performance Based
U4-OD-083	Unit 3 Instrument Air Equipment Area	Performance Based
U4-OD-084	Units 3 and 4 Aux Feedwater Pump Area	Performance Based
U4-OD-085	Unit 3 Main Condenser Area	Performance Based
U4-OD-086	Unit 3 Main and Startup Transformer Area	Performance Based
U4-OD-087	Unit 3 Aux Transformer Area	Performance Based
U4-OD-088	Unit 3 Switchgear/Diesel Generator Vestibule	Performance Based
U4-OD-089	Unit 3 Condensate Storage Tank Area	Performance Based
U4-OD-090	Unit 3 EDG Oil Storage Tank Area	Performance Based
U4-OD-091	Unit 4 Condensate Pump Area	Performance Based
U4-OD-092	Unit 3 Condensate Pump Area	Performance Based
U4-OD-105	Units 3 and 4 Turbine Building Mezzanine Deck	Performance Based
U4-OD-113	Unit 4 Feedwater Platform	Performance Based
U4-OD-114	Unit 4 Main Steam Header Platform	Performance Based
U4-OD-115	Unit 3 Main Steam Header Platform	Performance Based
U4-OD-116	Unit 3 Feedwater Platform	Performance Based
U4-OD-117	Units 3 and 4 Turbine Deck	Performance Based
U4-OD-118	Units 3 and 4 Aux Building Roof	Performance Based
U4-OD-122	Units 3 and 4 Water Treatment Plant & Area East	Performance Based
U4-OD-123	Units 3 and 4 Refueling Water Storage Tank Area	Performance Based
U4-OD-124	Outside Area NE of Unit 3 Containment	Performance Based
U4-OD-125	Land Area South of Unit 4 Containment	Performance Based
U4-OD-128	Units 3 and 4 Distribution Switchyard	Performance Based
U4-OD-131	Units 3A and 3B EDG Radiator Room	Performance Based
U4-OD-143	Unit 3 EDG Roof	Performance Based
U4-OD-999	Miscellaneous Areas	Performance Based
U4-OD-Intake	Units 3 and 4 Circulating Water Intake Structure and Intake Laydown Area	Performance Based
U4-OO	Units 3 and 4 B DC Equipment Room	Performance Based
U4-P	Unit 4 Containment Building	Performance Based
U4-PP	Unit 4 Battery Rack A Room	Performance Based
U4-Q	Unit 3 Containment Building	Deterministic
U4-QQ	Unit 3 Battery Rack B Room	Deterministic

U4-R	Unit 4 Reactor Control Rod Equipment Room	Performance Based
U4-RR	Unit 4 EDG Train A Room	Performance Based
U4-S	Units 3 and 4 Computer Room	Performance Based
U4-SS	Units 4 Train B EDG Room	Performance Based
U4-T	Unit 3 Reactor Control Rod Equipment Room	Performance Based
U4-TT	Unit 3 Switchgear Room 3D	Deterministic
U4-U	Unit 4 4160V Switchgear 4B Room	Performance Based
U4-UU	Unit 4 Switchgear Room 4D	Deterministic
U4-V	Unit 4 4160V Switchgear 4A Room	Performance Based
U4-V V	Unit 4 Train A EDG Control Room	Performance Based
U4-W	Unit 3 4160V Switchgear 3B Room	Performance Based
U4-WW	Unit 4 Train A Diesel Oil Transfer Pump Room & Diesel Oil Storage Tank (Zones 141 and 142)	Deterministic
U4-X	4160V Switchgear 3A Room	Performance Based
U4-XX	Unit 4 Train B Diesel Oil Transfer Pump Room & Diesel Oil Storage Tank (Zones 136 and 137)	Deterministic
U4-Y	Unit 3 Train B EDG Building	Deterministic
U4-YY	Unit 4 Train B EDG Building	Performance Based
U4-Z	Unit 3 Train A EDG Building	Deterministic

For each fire area, the licensee documented:

- The approach used in accordance with NFPA 805 (i.e., the deterministic approach in accordance with NFPA 805, Section 4.2.3 or the PB approach in accordance with NFPA 805, Section 4.2.4);
- The SSCs required in order to meet the NSPC;
- Fire detection and suppression systems required to meet the NSPC;
- An evaluation of the effects of fire suppression activities on the ability to achieve the NSPC; and
- The resolution of each VFDR using either modifications (completed or planned) or the performance of an FRE in accordance with NFPA 805, Section 4.2.4.2.

3.5.1.1 Fire Detection and Suppression Systems Required to Meet the NSPC

A primary purpose of NFPA 805, Chapter 4 is to determine, by analysis, what fire protection features and systems need to be credited to meet the NSPC. Four sections of NFPA 805, Chapter 3 have requirements dependent upon the results of the engineering analyses performed in accordance with NFPA 805, Chapter 4. They are as follows: (1) fire detection systems in accordance with Section 3.8.2, (2) automatic water-based fire suppression systems in accordance with Section 3.9.1, (3) gaseous fire suppression systems in accordance with Section 3.10.1, and (4) passive fire protection features in accordance with Section 3.11. The features/systems addressed in these sections are only required when the analyses performed in

accordance with NFPA 805, Chapter 4 indicate the features and systems are required to meet the NSPC.

The licensee performed a detailed analysis of fire protection features and identified the fire suppression and detection systems required to meet the NSPC for each fire area. LAR Attachment C, Table C-2, "NFPA 805 Required Fire Protection Systems and Features," identified required fire protection system(s)/features for each fire area and fire zone. This table identifies the fire suppression and detection systems required to meet criteria for separation, DID, risk, licensing actions, or existing engineering equivalency evaluations (EEEEs).

In FPE RAI 08 (Reference 22), the NRC staff requested that the licensee provide more detail regarding the particular nature of the credit being taken for floor drains. In its response to FPE RAI 08 (Reference 10), the licensee stated that the engineering evaluations in LAR Attachment C, Table C-1, "NFPA 805 Ch 4 Compliance (NEI 04-02, Table B-3)," were reviewed to identify which fire zones require drains and none were identified. The licensee further stated that floor drains are not a required fire protection feature in any fire zone, and when determining which systems and features were associated with the evaluations, certain curbs were also not a required feature in some fire zones. The licensee provided a revised LAR Attachment C, Table C-2, "NFPA 805 Required Fire Protection Systems and Features," to update the removal of floor drains and removal of certain curbs from the fire protection systems/features table.

The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee demonstrated that floor drains and some curbs are not required fire protection features.

In FPE RAI 14 (Reference 23), the NRC staff requested that the licensee provide a review to ensure that all fire suppression and detection systems credited and required by the MCA of the FPRA, or by NFPA 805, Chapters 3 or 4, had been fully documented in the LAR. In its response to FPE RAI 14 (Reference 13), the licensee provided a revised LAR Attachment C, Table C-2 that included fire suppression and detection systems credits as follows:

- Automatic suppression is credited in the MCA report for Fire Zones 045, 055, 072, 073, 074, 075, 098, 108A, 108B, 132, 133, 136, and 141.

- Automatic detection is credited in the MCA report for Fire Zones 004, 005, 009, 010, 011, 012, 013, 014, 015, 016, 020, 021, 022, 025, 025A, 026, 030, 040, 045, 046, 055, 058, 059, 061, 062, 063, 067, 068, 070, 071, 072, 073, 074, 075, 093, 094, 095, 096, 097, 098, 101, 102, 103, 104, 106, 108A, 108B, 109, 110, 132, 133, 134, 135, 136, 139, 140, and 141.

The licensee also developed a new basis category for required systems in LAR Section 4.8.1, "Results of the Fire Area Review," and added a "Category A" to the table to identify systems/features required to meet the assumptions of the MCA.

The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee appropriately identified the fire suppression and detection systems credited in the MCA.

The NRC staff reviewed each fire area in revised LAR Attachment C, Table C-2 to ensure the fire detection and suppression systems met the principles of DID in regard to the planned transition to NFPA 805. The NRC staff concludes that the licensee adequately identified the fire detection and suppression systems and fire protection features required to meet the NFPA 805 NSPC on a fire area basis.

3.5.1.2 Evaluation of Fire Suppression Effects on Nuclear Safety Performance Criteria

Each fire area, LAR Attachment C, Table C-1, "NFPA 805 Ch 4 Compliance (NEI 04-02, Table B-3)," included a discussion of the licensee's evaluation of fire suppression effects on the ability to meet the NSPC.

The licensee stated that damage to plant areas and equipment from the accumulation of water discharged from manual and automatic fire protection systems and the discharge of manual suppression water to adjacent compartments is controlled. The licensee further stated that for those areas with Halon system discharge, the discharge will not affect the operation of mechanical and electrical equipment in the room, and therefore, fire suppression activities will not adversely affect achievement of the NSPC.

Based on the information provided by the licensee in the LAR, as supplemented, the licensee evaluated fire suppression effects on meeting the NSPC and determined that fire suppression activities will not adversely affect achievement of the NSPC. The NRC staff reviewed this information and concludes that the licensee's evaluation of the suppression effects on the NSPC is acceptable.

3.5.1.3 Licensing Actions

Based on the information provided in LAR Attachment C, Table C-1, "NFPA 805 Ch 4 Compliance (NEI 04-02, Table B-3)," and LAR Attachment K, "Existing Licensing Action Transition," as supplemented, the licensee identified exemptions from the deterministic requirement for each fire area that were previously approved by the NRC and the underlying engineering evaluation will be transitioned with the NFPA 805 FPP. Each of these exemptions is summarized in LAR Attachment C on fire area basis and described in further detail in LAR Attachment K. The licensee proposed clarifications to the previously approved licensing actions and documented these clarifications in LAR Attachment T, "Clarification of Prior NRC Approvals." The licensee utilized the process described in LAR Section 4.2.3, which requires a determination of the basis of acceptability and a determination that the basis of the acceptability is still valid for the licensing actions that will be transitioned. The licensing actions being transitioned, including the clarifications, are summarized in SE Table 3.5-2.

Table 3.5-2: Previously Approved Licensing Actions Being Transitioned

Licensing Action Description	**Applicable Fire Areas**	**LAR Attachment T Clarification**	**NRC Staff Evaluation**
LA-02-19840327, 10 CFR 50, Exemption from the Appendix R, Section III.O requirement for having an oil collection tank sized to contain the entire lube oil system inventory.	P (Unit 4 Containment Building) Q (Unit 3 Containment Building)	None	Based on the previous NRC staff approval of this exemption in an SER dated 3/27/84 (Reference 33), and the statement by the licensee that the basis remains valid, the NRC staff concludes that this licensing action is acceptable.
LA-07-19840327, 10 CFR 50, Exemption from the Appendix R, Section III.G.2.f requirement for providing non-combustible radiant energy shields in fire areas P and Q where separation is less than 20 feet.	P (Unit 4 Containment Building) Q (Unit 3 Containment Building)	1.) The SER basis used the term "free of intervening combustibles," which was not the intent of the FPL submittal provided. The licensee requested the NRC formally document as a "prior approval" recognition that FPL should not use the expression "free of intervening combustibles" or "void of in situ combustibles." The statement should have been "void of significant in situ combustibles" and "located within the biological shield wall in an area having no in situ combustibles in proximity to the valves." 2.) It is requested that the NRC formally document as a "prior approval" recognition that portable extinguishers are no longer staged inside Containment. Due to concerns from elevated temperatures, water extinguishers are staged inside containment during refueling outages and removed during operation. In addition, dry chemical extinguishers are mounted outside on the access stair handrails and readily accessible for brigade use.	Based on the previous NRC staff approval of this exemption in an SER dated 3/27/84 (Reference 33), and the statement by the licensee that the basis remains valid, the NRC staff concludes that this licensing action is acceptable.

LA-10-19870812, 10 CFR 50, Exemption from the Appendix R, Section III.G.2.d requirement for separation of intervening combustibles inside the primary containment.	P (Unit 4 Containment Building) Q (Unit 3 Containment Building)	None	Based on the previous NRC staff approval of this exemption in an SER dated 8/12/87 (Reference 35), and the statement by the licensee that the basis remains valid, the NRC staff concludes that this licensing action is acceptable.

The NRC staff reviewed the exemptions from the pre-NFPA 805 licensing basis identified in Table 3.5-2, including the description of the previously approved exemption from the deterministic requirements, the basis for and continuing validity of the exemption, and the NRC staff's original evaluation or basis for approval of the exemption. In LAR Attachment K, the licensee stated that for each transitioned exemption, the review of the existing licensing actions included a determination of the basis of acceptability and a determination that the basis of acceptability is still valid, except as identified in LAR Attachment T, and further described in this SE Section 3.5.2.

Based on the NRC staff's review of the licensing actions identified and described in LAR Attachments C and K, and the clarifications in LAR Attachment T, the NRC staff concludes that the licensing actions are identified by applicable fire area and remain valid to support the proposed license amendments because the licensee utilized the process described in NEI 04-02 (Reference 5) as endorsed by RG 1.205 (Reference 4), which includes a determination of the basis of acceptability and a determination that the basis is still valid.

Based on the previous NRC staff approval of the exemptions and the statement by the licensee that the basis remains valid, as presented in each appropriate fire area, the NRC staff concludes that the engineering evaluations being carried forward supporting the NFPA 805 transition as identified in Table 3.5-2 are acceptable because they are in accordance with NFPA 805, Section 2.2.7. (See SE Section 2.5, "Rescission of Exemptions," for further discussion.)

3.5.1.4 Existing Engineering Equivalency Evaluations

The EEEEs that support compliance with NFPA 805, Chapter 4 were reviewed by the licensee using the methodology contained in NEI 04-02. The methodology for performing the EEEE review included determinations that:

- The EEEE is not based solely on quantitative risk evaluations,
- The standard license condition is met,
- The EEEE is technically adequate,

- The EEEE reflects the plant as-built condition, and
- The basis for acceptability of the EEEE remains valid.

In LAR Section 4.2.2, "Existing Engineering Equivalency Evaluation Transition," the licensee stated that the guidance in RG 1.205 (Reference 4), Regulatory Position 2.3.2, and FAQ 08-0054 (Reference 80) were followed. EEEEs that demonstrate a fire protection system or feature is "adequate for the hazard" are to be addressed in the LAR as follows:

- If not requesting specific approval for "adequate for the hazard" EEEEs, then the EEEE is referenced where required and a brief description of the evaluated condition is provided.
- If requesting specific NRC approval for "adequate for the hazard" EEEEs, then the EEEE is referenced where required to demonstrate compliance and is included in LAR Attachment L, "NFPA 805, Chapter 3 requirements for approval (10 CFR 50.48(c)(2)(vii))," for NRC review and approval.

The licensee identified and summarized the EEEEs for each fire area in LAR Attachment C as applicable. The licensee did not request that the NRC staff review and approve any of these EEEEs.

Based on the NRC staff's review of the licensee's methodology for review of EEEEs and identification of the applicable EEEEs in LAR Attachment C, Table C-1, the NRC staff concludes that the use of EEEEs is acceptable because it meets the requirements of NFPA 805 and the guidance provided in RG 1.205 and FAQ 08-0054.

3.5.1.5 Variances from Deterministic Requirements

For those fire areas where deterministic criteria were not met, VFDRs were identified and evaluated using PB methods. VFDR identification, characterization, and resolutions were identified and summarized in LAR Attachment C, Table C-1, "NFPA 805 Ch 4 Compliance (NEI 04-02, Table B-3)," for each fire area. Documented VFDRs were all represented as separation issues. The following strategies were used by the licensee in resolving these VFDRs:

- A FRE determined that applicable risk, DID, and safety margin criteria were satisfied without further action; or
- A FRE determined that applicable risk, DID, and safety margin criteria were satisfied with a credited RA; or
- A FRE determined that applicable risk, DID, and safety margin criteria were satisfied with a DID RA; or
- A FRE determined that applicable risk, DID, and safety margin criteria were satisfied with a plant modification(s), as identified in LAR Attachment C,

Table C-1, "NFPA 805 Ch 4 Compliance (NEI 04-02, Table B-3)," as well as LAR Attachment S, Table S-1 "Plant Modifications Completed," and LAR Attachment S, Table S-2, "Plant Modifications Committed."

For all fire areas where the licensee used the PB approach to meet the NSPC, each VFDR and the associated resolution are described in LAR Attachment C, Table C-1. The NRC staff concludes that the licensee's identification and resolution of the VFDRs is acceptable because the licensee performed its analysis in accordance with the criteria in NEI 04-02 (Reference 7) as endorsed by RG 1.205 (Reference 4).

3.5.1.6 Recovery Actions

LAR Attachment G, "Recovery Actions Transition," lists the RAs identified in the resolution of VFDRs in LAR Attachment C, Table C-1, "NFPA 805 Ch 4 Compliance (NEI 04-02, Table B-3)," for each fire area. The RAs identified include both actions considered necessary to meet risk acceptance criteria, as well as actions relied upon for DID (see SE Section 3.5.1.7 below). The NRC staff reviewed LAR Section 4.2.1.3, "Establishing Recovery Actions," and LAR Attachment G to evaluate whether the licensee meets the associated requirements for the use of RAs per NFPA 805. The details of the NRC staff review of RAs are described in SE Section 3.2.5, "Establishing Recovery Actions." The NRC staff's evaluation of the additional risk of RAs credited to meet the risk acceptance guidelines is provided in SE Section 3.4.4.

3.5.1.7 Recovery Actions Credited for Defense in Depth

The licensee stated in LAR Attachment G that RAs were identified to maintain a sufficient level of DID for some fire areas, and that it performed a feasibility analysis for each RA in accordance with the criteria in NEI 04-02 (Reference 7); FAQ 07-0030, Revision 5 (Reference 71); and RG 1.205 (Reference 4). RAs used as DID are not credited in the risk determination for the fire area but are credited in the FREs to eliminate DID imbalance. Although the nuclear safety and radioactive release performance goals, objectives, and criteria of NFPA 805 are met without these actions, these RAs are required for DID and are part of the RI/PB FPP, which necessitates that these actions would be subject to a PCE if subsequently modified or removed.

The NRC staff reviewed LAR Section 4.2.1.3, "Establishing Recovery Actions," and LAR Attachment G, to evaluate whether the licensee meets the associated requirements for the use of RAs per NFPA 805. The details of the NRC staff review for RAs are described in SE Section 3.2.5, "Establishing Recovery Actions."

3.5.1.8 Plant Fire Barriers and Separations

With the exception of ERFBS, passive fire protection features include the fire barriers used to form fire area boundaries (and barriers separating SSD trains) that were established in accordance with the plant's pre-NFPA 805 deterministic FPP. For the transition to NFPA 805, the licensee decided to retain the previously established fire area boundaries as part of the RI/PB FPP.

Fire area boundaries are established for those areas described in LAR Attachment C, Table C-1, "NFPA 805 Ch 4 Compliance (NEI 04-02, Table B-3)," as modified by applicable

EEEEs that determine the barriers are adequate for the hazard or otherwise resolve differences in barrier design and performance from applicable criteria. The acceptability of fire barriers and separations is also evaluated as part of the NRC staff's review of LAR Attachment A, "NEI 04-02, Table B-1, Transition of Fundamental Fire Protection Program & Design Elements," and as such are addressed in SE Section 3.1.

3.5.1.9 Electrical Raceway Fire Barrier Systems

The licensee stated that the ERFBS used meet the deterministic requirements of NFPA 805, Chapter 3, Section 3.11.5, via Engineering Evaluations. Each fire area using ERFBS is identified in LAR Attachment C, Table C-1, "NFPA 805 Ch 4 Compliance (NEI 04-02, Table B-3)." The licensee further stated that in fire areas with deterministic compliance, the ERFBS meet the requirements of NFPA 805, Section 4.2.3 and that in fire areas with PB compliance, the ERFBS were analyzed using the PB approach in accordance with NFPA 805, Section 4.2.4. Each PB fire area relying on ERFBS, as identified in LAR Attachment C, included a description of any credit used to evaluate the acceptability of this feature. Where a performance goal relied on credited ERFBS, the licensee listed a description of the components being protected in LAR Attachment C for each fire area, and subsequently identified in LAR Attachment C, Table C-2 as a required fire protection feature.

3.5.1.10 Conclusion for Section 3.5.1

As documented in LAR Attachment C, for those fire areas that used a deterministic approach in accordance with NFPA 805, Section 4.2.3, the NRC staff concludes that each of the fire areas analyzed using the deterministic approach meet the associated criteria of NFPA 805, Section 4.2.3. This conclusion is based on:

- The licensee's documented compliance with NFPA 805, Section 4.2.3;
- The licensee's assertion that the success path will be free of fire damage without reliance on RAs;
- The licensee's assessment that the suppression systems in the fire area will have no impact on the ability to meet the NSPC; and
- The licensee's appropriate determination of the automatic fire suppression and detection systems required to meet the NSPC.

For those fire areas that used the PB approach in accordance with NFPA 805, Section 4.2.4, the NRC staff concludes that each fire area has been properly analyzed, and that compliance with the NFPA 805 requirements demonstrated as follows:

- Exemptions from the pre-NFPA 805 fire protection licensing basis that were transitioned to the NFPA 805 licensing basis were reviewed for applicability, as well as continued validity, and found acceptable (see SE Sections 3.5.1.3 and 3.5.1.4).

- VFDRs were evaluated and either found to be acceptable based on an integrated assessment of risk, DID, and safety margins, or modifications or RAs were identified and actions planned or implemented to address the issue (see SE Section 3.5.1.5).

- RAs used to demonstrate the availability of a success path to achieve the NSPC were evaluated and the additional risk of their use determined, reported, and found to be acceptable (see SE Sections 3.5.1.6 and 3.5.1.7).

- The licensee's analysis appropriately identified the fire protection SSCs required to meet the NSPC, including fire suppression and detection systems, as well as required fire protection features (see SE Sections 3.5.1.1 and 3.5.1.2).

- Fire area boundaries (ceilings, walls, and floors), such as fire barriers, fire barrier penetrations, and through penetration fire stops (see SE Section 3.5.1.8).

- ERFBS credited were documented on a fire area basis, verified to be installed consistent with tested configurations and rated accordingly, and evaluated using an FRE that demonstrated the ability to meet the applicable acceptance criteria for risk, DID, and safety margins (see SE Section 3.5.1.9).

Accordingly, the NRC staff concludes that each fire area utilizing the PB approach is able to achieve and maintain the NSPC, and the associated FREs meet the applicable NFPA 805 requirements for risk, DID, and safety margins.

3.5.2 Clarification of Prior NRC Approvals

The elements of the pre-transition FPP licensing basis for which specific NRC previous approval needs clarification are included in LAR Attachment T. The clarification requests included sufficient detail to demonstrate how those elements of the pre-transition FPP licensing basis meet the requirements in 10 CFR 50.48(c) (RG 1.205, Revision 1, Regulatory Position 2.2.1). (See SE Section 3.5.1.3 for a summary of the licensing actions being transitioned.)

3.5.3 Fire Protection During Non-Power Operational Modes

NFPA 805, Section 1.1, "Scope," states:

> This standard specifies the minimum fire protection requirements for existing light water nuclear power plants during all phases of plant operation, including shutdown, degraded conditions, and decommissioning.

NFPA 805, Section 1.3.1, "Nuclear Safety Goal," states:

> The nuclear safety goal is to provide reasonable assurance that a fire during any operational mode and plant configuration will not prevent the plant from achieving and maintaining the fuel in a safe and stable condition.

The NRC staff reviewed LAR Section 4.3, "Non-Power Operational Modes," and LAR Attachment D, "NEI 04-02 Non-Power Operational Modes Transition," to evaluate the licensee's treatment of potential fire impacts during non-power operations (NPO). The NRC staff's evaluation determined that the licensee used the process described in NEI 04-02, as modified by FAQ 07-0040 (Reference 75), for demonstrating that the NSPC are met for higher risk evolutions (HREs) during NPO modes.

3.5.3.1 NPO Strategy and Plant Operating States

In LAR Section 4.3 and LAR Attachment D, the licensee stated that the process used to demonstrate the NSPC is met during NPO modes is consistent with the guidance contained in FAQ 07-0040. The licensee identified existing station procedures for outage risk assessment and control that implement the licensee's philosophy of outage risk management for Modes 5 and 6, and when the reactor is defueled, which the licensee developed to implement requirements and commitments made in response to various regulatory and industry guidelines. In addition to providing guidance on shutdown risk principles and performance of risk assessments, the procedure identifies the Key Safety Functions (KSFs) that need to be maintained, as well as providing guidelines for maintaining them. HREs during NPO modes involve outage activities, plant configurations, or conditions during shutdown where the plant is more susceptible to an event causing the loss of one or more KSFs. The NPO evaluation performed by the licensee identified the following high-risk evolutions based on decay heat load, RCS and spent fuel pool inventory, and their effects on time to boil:

- Reduced RCS Inventory Operations,
- Mid-loop Operation,
- Vented RCS Operations,
- RCS Operations with plant at high pressure with RHR aligned, and
- Any specific evolution determined by Station Management.

Based on the above, the NRC staff concludes that, as described in the LAR, the licensee adequately identified equipment and cables necessary to support the KSFs success paths. The NRC staff also concludes that the NPO process described and documented by the licensee in LAR Section 4.3 and LAR Attachment D is acceptable because it is consistent with FAQ 07-0040, which clarifies the guidance regarding reasonable assurance that a fire during NPO will not prevent the plant from achieving the fuel in a safe and stable condition.

3.5.3.2 NPO Analysis Process

The licensee stated that the NPO evaluation performed area analysis for the components selected to meet the KSFs that either directly impact or support KSFs, which impact fuel heat-up or could uncover the core (i.e., Decay Heat Removal, Inventory Control, Reactivity Control, On-site and Off-site Power). The licensee further stated that the analysis evaluated the possible effects of fire on the Shutdown Monitoring Instrumentation KSF to indicate where a pinch point

could impact a plant commitment. The licensee further stated that it performed the area analysis utilizing the NICAD database, which produced reports indicating the cables in an area and the components and KSF paths those cables affected, and that it did not use FM to eliminate "pinch points" within a fire zone. The licensee further stated, however, that the analysis did utilize fire scenarios developed for the FPRA model, and those scenarios were used to determine which NPO cables were susceptible to fire damage from a fire originating in an adjacent fire zone.

The NRC staff concludes that the licensee's process for the selection and treatment of components and cables is consistent with the methodology in the NSCA and that included in this process is the assignment of NPO specific functional states for each component.

3.5.3.3 NPO KSFs and SSCs Used to Achieve Performance

LAR Attachment D defines the KSFs, the success paths to achieve the KSFs, and the components required for the success paths. For each unit, components were identified to provide the KSFs of Decay Heat Removal, Electrical Distribution System, Inventory and Reactivity Control, and Shutdown Monitoring Instrumentation. The selection of equipment is further broken down based on consideration of KSF success paths.

Pinch points refer to a particular location in an area where the damage from a single fire scenario could result in failure of multiples components or trains of a system such that the maximum detriment on that system's performance would be realized from the single fire scenario. Typically, this involves close vertical proximity of cables, which support redundant components or trains of a system, such that all such cables can be damaged by just one fire scenario.

Based on its review of the information provided in the LAR, as supplemented, the NRC staff concludes that the licensee's NPO analysis is acceptable because the licensee used methods consistent with the guidance provided in RG 1.205 and FAQ 07-0040 to identify the equipment required to achieve and maintain the fuel in a safe and stable condition during NPO modes. Furthermore, the licensee has a process in place to ensure that fire protection DID measures will be implemented to achieve the KSFs during plant outages and identified Implementation Item 14 in LAR Attachment S, Table S-3, to implement enhancements to procedures for remote reactor vessel drainage level monitoring. The NRC staff concludes that this action is acceptable because it will incorporate the provisions of NFPA 805 in the FPP and would be required by the proposed license condition.

3.5.3.4 NPO Pinch Point Resolutions and Program Implementation

LAR Attachment D includes the licensee discussion of the NPO modes transition. The licensee stated that there are 93 analysis areas for each of the two units for which the results of the analyses are summarized below:

- There are 44 areas where each KSF for both units would still have a success path following the postulated fire. Limited recommendations are made for these areas.

- Unit 3 has 11 areas and Unit 4 has 10 areas where each KSF has a success path. All other areas have at least 1 KSF that does not have a success path. Limited recommendations are made for these areas for the unit that is not impacted.

- There are 3 areas (the areas designated as control room evacuation areas) where both units could lose all KSFs from a postulated fire. These areas already have strict transient and in situ combustible controls.

- Unit 3 has 35 areas and Unit 4 has 36 areas where a postulated fire could cause a loss of the success paths for some of their KSFs. Recommendations for more conservative fire controls during HREs in these areas have been proposed.

In SSD RAI 03.a (Reference 22), the NRC staff requested that the licensee identify and describe the changes to outage management procedures, risk management tools, and any other document resulting from incorporation of KSF. In its response to SSD RAI 03.a (Reference 10), the licensee stated its intent to make revisions to fleet level shutdown risk management procedures and associated site specific procedures for managing risk during NPO. The licensee further stated that these documents will provide departments and organizations that plan outage related work and the licensee's assessment team with shutdown risk management guidance to include:

- Definition and criteria for specifying HREs, and

- Identification of KSFs affected by fire area for each unit.

The licensee further stated that additional guidance will also include proposed options to reduce fire risk in those locations where fire can result in loss of one or more KSFs during HREs that would include:

- Restriction of hot work in areas during periods of increased vulnerability,

- Verification of functional detection and/or suppression in the vulnerable analysis areas,

- Restriction of transient combustible materials in areas during periods of increased vulnerability,

- Plant equipment configuration changes (e.g., removing power from equipment once it is placed in its desired position),

- Provision of additional fire patrols at periodic intervals or other appropriate compensatory measures (such as surveillance cameras) during increased vulnerability, or

- Reschedule the work to a period with lower risk or higher DID.

The licensee identified the proposed enhancements in LAR Attachment S, Table S-3, Implementation Item 14. The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee identified a required action that will incorporate the appropriate revisions to procedures to manage risk during NPO and included the action as an implementation item in LAR Attachment S that would be required by the proposed license condition.

In SSD RAI 03(d) (Reference 22), the NRC staff requested that the licensee provide a description of any actions, including pre-fire staging actions, being credited to minimize the impact of fire-induced spurious actuations on power operated valves. In its response to SSD RAI 03(d) (Reference 10), the licensee stated that there are no actions, including pre-staging actions, being credited to minimize the impact of fire induced spurious actuations, and these approaches remain as available options, conditions, and equipment alignments that may occur during an outage. The licensee further stated that these options would be in response to removing equipment from service.

The NRC staff concludes that the licensee response to the RAI is acceptable because the licensee explained that no actions including pre-staging are being credited to minimize the impact on fire induced spurious actuations.

In SSD RAI 03.e (Reference 22), the NRC staff requested the licensee describe the types of compensatory actions that will be used during normal outage evolutions when certain NPO credited equipment will have to be removed from service. In its response to SSD RAI 03.e (Reference 10), the licensee indicated that station procedures for outage risk assessment and control, completed prior to entry into Mode 5 and before each planned plant configuration change, provide the types of compensatory actions that will be used. The licensee further stated some of the actions taken include restriction of hot work in areas during periods of increased vulnerability, verification of functional detection and/or suppression in the vulnerable analysis areas, and plant equipment configuration changes. The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee identified the types of compensatory actions that will be used and confirmed that administrative controls are in place to provide compensatory actions when needed.

The licensee stated that an evaluation identified the components necessary to accomplish the KSFs using a methodology consistent with that identified for the SSD component selection, including identification of components whose spurious operation (single and multiple) could impair the system. The licensee further stated that if the component was already part of the SSA, that component was further evaluated to determine if its functional state (i.e., normal position, state of interlock, and auto-actuation signals, etc.) remained the same between SSD and NPO, and components with different functional states or which were not in the SSA, had cable selection and routing performed.

In SSD RAI 03.g (Reference 22), the NRC staff requested that the licensee describe the additional monitoring requirements associated with NPO because of the reactor vessel level indicator non-vital power supply. In its response to SSD RAI 03.g (Reference 10), the licensee indicated that it will require local monitoring during drain-down activities (either via video camera or by a person in containment in communication with the MCR), and any evolution that affects reactor vessel level will be immediately stopped if the method of monitoring the local reactor

vessel level indication is lost. In LAR Attachment D, the licensee stated that because of power supply issues involved with the remote reactor vessel draindown levels (breaker coordination and assurance of power to non-safety related buses), the following actions will be included in the enhancements to procedures for remote reactor vessel drainage level monitoring as described in LAR Attachment S, Table S-3, Implementation Item 14:

(a) Always requiring the local reactor vessel level indication be monitored during drain-down activities, either via video camera or by a person in containment in communication with the MCR.

(b) Immediately stopping any evolution that affects reactor vessel level if the method of monitoring the local reactor vessel level indication is lost, until the monitoring is restored.

(c) Immediately stationing a person in containment in communication with the MCR if video monitoring of drain-down level is lost, until the video monitoring is restored or until the HRE is complete.

In LAR Attachment D, the licensee stated that the video monitoring system will also not be powered from a coordinated and SSD unanalyzed source of power similar to the remote level indicators. The licensee provided the following justification:

(a) Vessel drain-down level is used for an operator cue and by itself will not change the time to boil or time to uncover the core.

(b) A fire would not likely cause the complex signals of video monitoring devices to display a frozen image. It would be more likely that the image would either display static or go completely blank if affected by a fire.

(c) The loss of the video transmission of vessel drain-down indication initiates the operator steps for mitigation (i.e., stop all evolutions that can affect level until a person is stationed at the sight glass with communications to the MCR).

The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee identified a required action that will incorporate the appropriate revisions to procedures to manage risk during NPO, and included the action as an implementation item in LAR Attachment S, which would be required by the proposed license condition.

NFPA 805 requires that the NSPC be met during any operational mode or condition, including NPO. As described above, the licensee performed the following engineering analyses to demonstrate that it meets this requirement:

- Identified the KSFs required to support the NSPC during NPO;

- Identified the plant operating states where further analysis is necessary during NPO;

- Identified the SSCs required to meet the KSFs during the plant operating states analyzed;

- Identified the location of these SSCs and their associated cables;

- Performed analyses on a fire area basis to identify pinch points were one or more KSF could be lost as a direct result of fire-induced damage; and

- Planned/implemented modifications to appropriate procedures in order to employ a fire protection strategy for reducing risk at these pinch points during HREs.

The NRC staff concludes that the licensee provided reasonable assurance that the NSPC are met during NPO modes and HREs, provided the successful completion of LAR Attachment S, Table S-3, Implementation Item 14, which would be required by the proposed license condition.

3.5.4 Conclusion for Section 3.5

The NRC staff reviewed the licensee's RI/PB FPP as described in the LAR, and its supplements, to evaluate the NSCA results. The licensee used a combination of the deterministic and the PB approaches in accordance with NFPA 805, Sections 4.2.3 and 4.2.4.

For those fire areas that utilized a deterministic approach, the NRC staff confirmed that:

- Fire suppression effects were evaluated and found to have no adverse impact on the ability to achieve and maintain the NSPC for each fire area, and

- The required automatic fire suppression and automatic fire detection systems were appropriately documented for each fire area.

Accordingly, the NRC staff concludes that there is reasonable assurance that each fire area utilizing the deterministic approach meets NFPA 805, Section 4.2.3.

For those fire areas where the licensee used a PB approach, the NRC staff confirmed that:

- The engineering equivalency evaluations from the existing FPP were evaluated and found to be valid and acceptable for meeting the requirements of NFPA 805, Section 2.2.7.

- Fire suppression effects were evaluated and found to have no adverse impact on the ability to achieve and maintain the NSPC for each fire area.

- All VFDRs were evaluated using the FRE PB method (in accordance with NFPA 805, Section 4.2.4.2) to address risk impact, DID, and safety margin, and found to be acceptable.

- All RAs necessary to demonstrate the availability of a success path were evaluated with respect to the additional risk presented by their use and found to be acceptable in accordance with NFPA 805, Section 4.2.4.

- All DID RAs were properly documented for each fire area.

- The required automatic fire suppression and automatic fire detection systems were appropriately documented for each fire area.

Accordingly, the NRC staff concludes that each fire area utilizing the PB approach in accordance with NFPA 805, Section 4.2.4 is able to achieve and maintain the NSPC. Furthermore, there is reasonable assurance that the associated FREs meet the requirements for risk, DID, and safety margin.

The NRC staff concludes that the licensee's analysis and outage management process during NPO modes provides reasonable assurance that the NSPC will be met during NPO modes and HREs and that the licensee used methods consistent with RG 1.205 and FAQ 07-0040.

3.6 Radioactive Release Performance Criteria

NFPA 805 (Reference 3), Chapter 1 defines the radioactive release goals, objectives, and performance criteria that must be met by the FPP in the event of a fire at an NPP in any operational mode.

NFPA 805, Section 1.3.2, "Radioactive Release Goal," states:

> The radioactive release goal is to provide reasonable assurance that a fire will not result in a radiological release that adversely affects the public, plant personnel, or the environment.

NFPA 805, Section 1.4.2, "Radioactive Release Objective," states:

> Either of the following objectives shall be met during all operational modes and plant configurations.
>
> (1) Containment integrity is capable of being maintained.
>
> (2) The source term is capable of being limited.

NFPA 805, Section 1.5.2, "Radioactive Release Performance Criteria," states:

> Radiation release to any unrestricted area due to the direct effects of fire suppression activities (but not involving fuel damage) shall be as low as reasonably achievable and shall not exceed applicable 10 CFR Part 20 limits.

In order to assess whether the FPP to be implemented under NFPA 805 meets the above requirements, the licensee performed a review of the existing fire pre-plans and fire brigade

training materials. Fire pre-plans that address fire areas where there is no possibility of radioactive materials being present (outside of the Radiologically Controlled Area) (RCA) were screened from further review. The screening of radiological areas was initially performed by the radioactive release report preparer, who through the use of the fire pre-plans, plant walkdowns, and interviews with station personnel, developed a list of areas that screened in or out of the radioactive release review. The list of areas was then reviewed by plant personnel, including radiation protection personnel, for accuracy. In addition, the radioactive release review report and the LAR were reviewed by multiple subject matter experts, which ensured a detailed review of the plant areas with the potential for containing radiological materials during any plant mode/operation. All other fire pre-plans were reviewed to ascertain whether existing engineering controls are adequate to ensure that radioactive materials (contamination) generated as a direct result of fire suppression activities are contained and monitored before release to unrestricted areas, such that the release would meet the NFPA 805 radioactive release performance criteria. LAR Attachment E provides the licensee's qualitative assessment of how the radioactive release goals, objectives, and performance criteria are met for each zone, on a fire zone by fire zone basis for both power and NPO.

The licensee's review determined that the current FPP will be compliant with the guidance in NEI 04-02 (Reference 7) and RG 1.205 (Reference 4), and the requirements of NFPA 805, upon completion of the implementation items identified in LAR Attachment S, Table S-3. With the exception of those fire zones discussed below, the licensee's qualitative review determined that plant buildings and structures provide sufficient capacity to contain the liquid and gaseous firefighting effluents such that the radioactive release performance criteria are not exceeded. The licensee's review identified several plant design features, such as roll-up doors, windows, or storm drains that could divert the liquid or gaseous effluents from being collected/processed as credited. Therefore, the fire pre-plans as identified in LAR Attachment E will be revised to assure that manual actions are taken to prevent offsite releases from those fire areas where there is a potential for such effluent diversions.

LAR Attachment E identifies several fire zones in the compartment "RCA-Outdoors/Yard." These locations are open to atmosphere with no special drainage features or additional suppression systems to aid in preventing a radioactive release. Small structures, land/sea containers, and drums that contain combustible radioactive materials are stored in these outdoor locations. As part of the NFPA 805 transition implementation addressed in LAR Attachment S, the licensee stated that it will stage materials and equipment necessary to prevent potentially contaminated run-off of firefighting effluents from entering the storm drain system. In addition, the licensee will establish administrative controls over the maximum curie content in each of the containers stored in outdoor areas to ensure that any possible release will be within the radiological performance criteria. In Radioactive Release RAI 03, the NRC staff requested that the licensee verify that administrative controls ensure no offsite releases or releases in doses in excess of the limits in 10 CFR Part 20 for areas where containment/confinement is not available. In its response to Radioactive Release RAI 03, the licensee performed a bounding analysis for the RCA-Outdoors/Yard compartment using calculations defined in the offsite dose calculation manual. The licensee stated that the worst-case source term was determined to be the largest curie containing Sea-Land trailer of dry active waste shipped in 2012 and that the calculation assumed that the Sea-Land trailer, stored in the RCA prior to shipment offsite, caught on fire and the radioactive contents were washed into the Cooling Canal System. The licensee further stated that the analysis determined that no

release rate or dose limits were exceeded due to a fire of this container. The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee demonstrated that the dose limits of 10 CFR Part 20 will not be exceeded in areas where containment/confinement are not available.

The licensee's review identified several buildings or compartments where the fire brigade is required to take manual actions, such as to verify doors closed, install equipment to contain outdoor runoff, and redirect ventilation flow within buildings in certain firefighting situations. In LAR Attachment S, Table S-3, Implementation Item 15, the licensee identified an action to implement the results of the radioactive release analysis. The site pre-fire plans will be modified to include references and recommendations for minimizing the likelihood of a radioactive release. Fire Brigade standard operating procedures will be developed to provide guidance and expectations for response to fires involving radioactive material. LAR Attachment E indicates that, for those fire areas not screened out of the review, the fire brigade training program will also be modified to include objectives for identifying radioactive release paths and actions that can be taken by the fire brigade to prevent radioactive release from that fire area. The fire brigade training program, pre-fire plans, operating procedures, and administrative controls will be modified to include enhanced radioactive release objectives during the implementation of the NFPA 805 transition. The NRC staff concludes the licensee's radioactive release program will be compliant with NFPA 805 upon completion of a required action that will incorporate the provisions of NFPA 805, NEI 04-02, and RG 1.204 in the licensee's FPP and included the action as an implementation item in LAR Attachment S, which would be required by the proposed license condition.

NFPA 805 requires the licensee to address the nuclear safety and radioactive release goals, objectives, and performance criteria in any operational mode. The licensee stated that ventilation and drainage engineering controls are not affected by the unit operating condition. However, LAR Attachment E notes that for some buildings, the likelihood of doors and hatches being open during outage time periods is much greater. Administrative guidance for fire brigade activities will drive actions consistent with the revised pre-fire plans and training to prevent uncontrolled radioactive release in these scenarios.

Based on (1) the information provided in the LAR, as supplemented, (2) the licensee's use of fire pre-plans, (3) the results of the NRC staff's evaluation of the identified engineered controls used to manage suppression water and combustion products, and (4) the development and implementation of newly revised fire brigade training procedures, the NRC staff concludes that subject to completion of the implementation items, the licensee's RI/PB FPP provides reasonable assurance that radiation releases to any unrestricted area resulting from the direct effects of fire suppression activities at Turkey Point are as low as reasonably achievable and are not expected to exceed the radiological dose limits in 10 CFR Part 20. In conclusion, the NRC staff finds that the licensee's RI/PB FPP complies with the requirements specified in NFPA 805, Sections 1.3.2, 1.4.2, and 1.5.2.

3.7 NFPA 805 Monitoring Program

3.7.1 Monitoring Program

For this SE section, the following requirements from NFPA 805 (Reference 3), Section 2.6 are applicable to the NRC staff's review of the licensee's LAR (Reference 8):

NFPA 805, Section 2.6, "Monitoring," states:

> A monitoring program shall be established to ensure that the availability and reliability of the fire protection systems and features are maintained and to assess the performance of the fire protection program in meeting the performance criteria. Monitoring shall ensure that the assumptions in the engineering analysis remain valid.

NFPA 805, Section 2.6.1, "Availability, Reliability, and Performance Levels," states:

> Acceptable levels of availability, reliability, and performance shall be established.

NFPA 805, Section 2.6.2, "Monitoring Availability, Reliability, and Performance," states:

> Methods to monitor availability, reliability, and performance shall be established. The methods shall consider the plant operating experience and industry operating experience.

NFPA 805, Section 2.6.3, "Corrective Action," states:

> If the established levels of availability, reliability, or performance are not met, appropriate corrective actions to return to the established levels shall be implemented. Monitoring shall be continued to ensure that the corrective actions are effective.

The NRC staff reviewed LAR Section 4.6, "Monitoring Program," that the licensee developed to monitor availability, reliability, and performance of FPP systems and features after the transition to NFPA 805. The NRC staff focused on the critical elements related to the monitoring program, including the selection of FPP systems and features to be included in the program, the attributes of those systems and features that will be monitored, and the methods for monitoring those attributes. Implementation of the monitoring program will occur on the same schedule as the NFPA 805 RI/PB FPP implementation, which the NRC staff finds acceptable (see SE Section 2.7).

The licensee stated that it will develop an NFPA 805 monitoring program consistent with FAQ 10-0059 (Reference 81), and that development of the monitoring program will include a review of existing surveillance, inspection, testing, compensatory measures, and oversight processes for adequacy. The licensee further stated that the review will examine adequacy of the scope of SSCs within the existing plant programs, performance criteria for availability and reliability of SSCs, and the adequacy of the plant corrective action program. The licensee further stated that the monitoring program will incorporate phases for scoping, screening using

risk criteria, risk target value determination, and monitoring implementation, and that the scope of the program will include fire protection systems and features, NSCA equipment, SSCs relied upon to meet radioactive release criteria, and fire protection programmatic elements.

Based on the information provided in the LAR, as supplemented, the NRC staff concludes that the licensee's NFPA 805 monitoring program, and development and implementation process is acceptable and assures that the licensee will implement an effective program for monitoring risk-significant fires because it:

- Establishes the appropriate SSCs to be monitored;
- Uses an acceptable screening process for determining the SSCs to be included in the monitoring program;
- Establishes availability, reliability, and performance criteria for the SSCs being monitored; and
- Requires corrective actions when SSC availability, reliability, and performance criteria targets are exceeded in order to bring performance back within the required range.

However, since the final values for availability and reliability, as well as the performance criteria for the SSCs being monitored, have not been established for the monitoring program as of the date of this SE, completion of the licensee's NFPA 805 Monitoring Program is an implementation item addressed in LAR Attachment S, Table S-3, Implementation Item 2.

The NRC staff concludes that completion of the monitoring program on the same schedule as the implementation of NFPA 805 is acceptable because the monitoring program will be completed with the other implementation items (except Items 12, 18, 19, and 22) as described in LAR Attachment S, Table S-3 no later than 12 months after issuance of the license amendments, which is prior to completion of the modifications to achieve full compliance with 10 CFR 50.48(c) (which is by the end of the second refueling outage (for each unit) following issuance of the license amendment).

3.7.2 Conclusion for Section 3.7

The NRC staff reviewed the licensee's RI/PB FPP and concludes that there is reasonable assurance that the licensee's monitoring program meets the requirements specified in Sections 2.6.1, 2.6.2, and 2.6.3 of NFPA 805 because the licensee identified an action to revise plant documents to monitor and trend the FPP, and included that action as an implementation item that would be required by the proposed license condition.

3.8 Program Documentation, Configuration Control, and Quality Assurance

For this SE, the requirements from NFPA 805 (Reference 3), Section 2.7, "Program Documentation, Configuration Control and Quality," are applicable to the NRC staff's review of

the LAR in regard to the appropriate content, configuration control, and quality of the documentation used to support the Turkey Point FPP transition to NFPA 805.

NFPA 805, Section 2.7.1.1, "General," states:

> The analyses performed to demonstrate compliance with this standard shall be documented for each nuclear power plant (NPP). The intent of the documentation is that the assumptions be clearly defined and that the results be easily understood, that results be clearly and consistently described, and that sufficient detail be provided to allow future review of the entire analyses. Documentation shall be maintained for the life of the plant and be organized carefully so that it can be checked for adequacy and accuracy either by an independent reviewer or by the AHJ.

NFPA 805, Section 2.7.1.2, "Fire Protection Program Design Basis Document," states:

> A fire protection program design basis document shall be established based on those documents, analyses, engineering evaluations, calculations, and so forth that define the fire protection design basis for the plant. As a minimum, this document shall include fire hazards identification and nuclear safety capability assessment, on a fire area basis, for all fire areas that could affect the nuclear safety or radioactive release performance criteria defined in Chapter 1.

NFPA 805, Section 2.7.1.3, "Supporting Documentation," states:

> Detailed information used to develop and support the principal document shall be referenced as separate documents if not included in the principal document.

NFPA 805, Section 2.7.2.1, "Design Basis Document," states:

> The design basis document shall be maintained up-to-date as a controlled document. Changes affecting the design, operation, or maintenance of the plant shall be reviewed to determine if these changes impact the fire protection program documentation.

NFPA 805, Section 2.7.2.2, "Supporting Documentation," states:

> Detailed supporting information shall be retrievable records. Records shall be revised as needed to maintain the principal documentation up-to-date.

NFPA 805, Section 2.7.3.1, "Review," states:

> Each analysis, calculation, or evaluation performed shall be independently reviewed.

NFPA 805, Section 2.7.3.2, "Verification and Validations" states:

> Each calculational model or numerical method used shall be verified and validated through comparison to test results or comparison to other acceptable models.

NFPA 805, Section 2.7.3.3, "Limitations of Use," states:

> Acceptable engineering methods and numerical models shall only be used for applications to the extent these methods have been subject to verification and validation. These engineering methods shall only be applied within the scope, limitations, and assumptions prescribed for that method.

NFPA 805, Section 2.7.3.4, "Qualification of Users," states:

> Cognizant personnel who use and apply engineering analysis and numerical models (e.g., fire modeling techniques) shall be competent in that field and experienced in the application of these methods as they relate to nuclear power plants, nuclear power plant fire protection, and power plant operations.

NFPA 805, Section 2.7.3.5, "Uncertainty Analysis" states:

> An uncertainty analysis shall be performed to provide reasonable assurance that the performance criteria have been met.

3.8.1 Documentation

The NRC staff reviewed LAR (Reference 8), Section 4.7.1, "Compliance with Documentation Requirements in Section 2.7.1 of NFPA 805," to evaluate the Turkey Point FPP design basis document and supporting documentation.

The Turkey Point FPP design basis is a compilation of multiple documents (i.e., fire safety analyses, calculations, engineering evaluations, NSCAs, etc.), databases, and drawings that are identified in LAR Figure 4-9, "NFPA 805 Planned Post-Transition Documentation and Relationships." The licensee stated that the analyses conducted to support the NFPA 805 transition were performed in accordance with Turkey Point processes, which meet or exceed the requirements for documentation outlined in NFPA 805, Section 2.7.1.

Specifically, the licensee stated that the design analysis and calculation procedures provide the methods and requirements to ensure that design inputs and assumptions are clearly defined, results are easily understood by being clearly and consistently described, and that sufficient detail is provided to allow future review of the entire analysis. The licensee further stated that the process includes provisions for appropriate design and engineering review and approval, and that the approved analyses are considered controlled documents, and are accessible via Turkey Point's document control system. The licensee further stated that the documents are also subject to review and revision consistent with the other plant calculations and analyses, as required by the plant design change process.

The LAR stated that the documentation associated with the FPP will be maintained for the life of the plant and organized in such a way to facilitate review for accuracy and adequacy by independent reviewers, including the NRC staff.

Based on the description provided in the LAR, as supplemented, of the content of the FPP design basis and supporting documentation, and taking into account the licensee's plans to maintain this documentation throughout the life of the plant, the NRC staff concludes that the licensee's approach for meeting the requirements of NFPA 805, Sections 2.7.1.1, 2.7.1.2, and 2.7.1.3, regarding adequate development and maintenance of the FPP design basis documentation, is acceptable.

3.8.2 Configuration Control

The NRC staff reviewed LAR Section 4.7.2, "Compliance with Configuration Control Requirements in Sections 2.7.2 and 2.2.9 of NFPA 805," in order to evaluate the licensee's configuration control process.

To support the many other technical, engineering and licensing programs, the licensee has existing configuration control processes and procedures for establishing, revising, or utilizing program documentation. Accordingly, the licensee is integrating the new FPP design basis and supporting documentation into these existing configuration control processes and procedures. These processes and procedures require that all plant changes be reviewed for potential impact on the various Turkey Point licensing programs, including the FPP.

The LAR stated that the configuration control process includes provisions for appropriate design, engineering reviews and approvals, and that approved analyses are considered controlled documents available through the document control system. The LAR also stated that analyses based on the PRA program, which includes the FREs, are issued as formal analyses subject to these same configuration control processes, and are additionally subjected to the PRA peer review process specified in the ASME/ANS PRA standard (Reference 45).

Configuration control of the existing FPP during the transition period is maintained by the change evaluation process, as defined in the existing configuration management and configuration control procedures. LAR Attachment S, Table S-3 includes implementation Item 16 to revise these procedures as necessary for application to the NFPA 805 FPP. The NRC staff concludes that this action is acceptable because it is included as an implementation item in LAR Attachment S, Table S-2, which would be required by the proposed license condition.

The NRC staff review of the licensee's process for updating and maintaining the FPRA in order to reflect plant changes made after completion of the transition to NFPA 805 is discussed in SE Section 3.4.

Based on the description of the Turkey Point configuration control process, which indicates that the new FPP design basis and supporting documentation will be controlled documents and that plant changes will be reviewed for impact on the FPP, the NRC staff concludes that, subject to completion of the implementation items, the licensee's configuration control process provides reasonable assurance that the requirements of NFPA 805, Sections 2.7.2.1 and 2.7.2.2 are met.

3.8.3 Quality

The NRC staff reviewed LAR Section 4.7.3, "Compliance with Quality Requirements in Section 2.7.3 of NFPA 805," to evaluate the quality of the engineering analyses used to support transition of the FPP to NFPA 805 based on the requirements outlined above. The individual sections of this SE provide the NRC staff's evaluation of the application of the NFPA 805 quality requirements to the licensee's FPP, as appropriate.

3.8.3.1 Review

NFPA 805, Section 2.7.3.1 requires that each analysis, calculation, or evaluation performed be independently reviewed. The licensee stated that its procedures require independent review of analyses, calculations, and evaluations, including those performed in support of compliance with 10 CFR 50.48(c). The LAR stated that the transition to NFPA 805 was independently reviewed, and that analyses, calculations, and evaluations to be performed post-transition will be independently reviewed, as required by existing procedures.

The NRC staff concludes that the licensee's approach for meeting the Quality requirements of NFPA 805, Section 2.7.3.1 is acceptable because the licensee demonstrated that procedures, analyses, calculations, and evaluations are independently reviewed.

3.8.3.2 Verification and Validation

NFPA 805, Section 2.7.3.2 requires that each calculational model or numerical method used be verified and validated through comparison to test results or other acceptable models. The licensee stated that the calculational models and numerical methods used in support of the transition to NFPA 805 were verified and validated, and that the calculational models and numerical methods used post-transition will be similarly verified and validated. As an example, the licensee provided extensive information related to the V&V of fire models used to support the development of the FREs. The NRC staff's evaluation of this information is discussed below.

3.8.3.2.1 General

NUREG-1824, "Verification and Validation of Selected Fire Models for Nuclear Power Plant Applications," Volumes 1-7 (Reference 57), documents the V&V of five selected fire models commonly used to support applications of RI/PB fire protection at NPPs. The seven volumes of this NUREG-series report provide technical documentation concerning the predictive capabilities of a specific set of fire dynamics calculation tools and fire phenomenological models that may be used for the analysis of fire hazards in postulated NPP scenarios. When used within the limitations of the fire models and considering the identified uncertainties, these models may be employed to demonstrate compliance with the requirements of 10 CFR 50.48(c).

Accordingly, for those FM elements performed by the licensee using the V&V applications contained in NUREG-1824 to support the transition to NFPA 805, the NRC staff concludes that the use of these models is acceptable, provided that the intended application is within the appropriate limitations of the model, as identified in NUREG-1824.

In LAR Attachment J, the licensee identified the use of several empirical correlations that are not addressed in NUREG-1824 (see SE Section 3.4.2.3.1). The NRC staff reviewed these correlations, as well as the related material provided in the LAR, in order to determine whether the licensee adequately demonstrated alignment with specific portions of the applicable NUREG-1824 guidance.

The NRC staff concludes that the theoretical bases of the models and empirical correlations used in the FM calculations that were not addressed in NUREG-1824 were identified and described in authoritative publications, peer reviewed journal articles or conference papers, or national research laboratory reports (References 110 – 124).

Table 3.8-1, "V&V Basis for Fire Modeling Correlations Used at Turkey Point," in SE Attachment A and Table 3.8-2, "V&V Basis for Other Fire Models and Related Calculations Used at Turkey Point," in SE Attachment B, identify these empirical correlations and algebraic models.

The FM employed by the licensee in the development of the FREs used empirical correlations that provide bounding solutions for the ZOI; and conservative input parameters, which produced conservative results for the FM analysis. The empirical correlations and models were used to develop a generic methodology to determine the ZOI from pre-calculated tables. This methodology is documented in the GFMTs approach. (See SE Section 3.4.2.3 for further discussion of the licensee's FM method.)

Based on the above, the NRC staff concludes that this approach provides reasonable assurance that the FM used in the development of the fire scenarios for the Turkey Point FREs is appropriate, and thus acceptable for use in transition to NFPA 805 because the V&V of the empirical correlations used by the licensee were consistent with either NUREG-1824, authoritative publications, peer reviewed journal articles, or national research laboratory reports.

3.8.3.2.2 Discussion of RAIs

In a letter dated March 15, 2013 (Reference 22), the NRC staff sought additional information (RAIs) concerning the FM conducted to support the FPRA. In letters dated March 18, 2013 (Reference 10); April 16, 2013 (Reference 11); and May 15, 2013 (Reference 12), the licensee responded to the RAIs. In a letter dated November 7, 2013 (Reference 23), the NRC sent additional RAIs to the licensee. In a letter dated January 7, 2014 (Reference 13), the licensee provided a response to the RAIs.

- In FM RAI 03.b (Reference 22), the NRC staff requested that the licensee confirm that the Froude number was within the NUREG-1824 validated range for the fire scenarios that were modeled with CFAST, or to provide technical justification for the use of CFAST with Froude numbers outside the validated range.

  In its response to FM RAI 03.b (Reference 10), the licensee discussed the Froude numbers calculated for the different types of ignition sources that were specified in the CFAST runs (i.e., closed electrical panels, open electrical panels, transient ignition sources, and cable trays). The licensee explained that for

closed electrical panels there is no meaningful way to define the area of the fire, and therefore, no meaningful way to calculate the Froude number since combustion occurs inside the panel. The licensee further stated that closed electrical panel fires are modeled as open source fires with a Froude number that is within the validated range. The licensee's calculations for open panel fires (Case 5 in NUREG/CR-6850) show that the Froude number is below the validated range for Bins 11 and 12, and within the validated range for the remaining bins. However, the licensee determined that the Froude number for these two bins is within the validated range at the time of MCR abandonment. The licensee's calculations for transient fires (Case 8 in NUREG/CR-6850) show that the Froude number is below the validated range for nearly all the bins, which implies that the calculated MCR abandonment times for transient fires may be non-conservative. The licensee explained that this potential non-conservatism is offset by the lower HGL temperature limit (50 °C) used in the control room abandonment analysis, instead of the tenability limit recommended in NUREG/CR-6850 (95 °C). The licensee's calculations show that the Froude number is below the validated range for cable tray fires, which implies that conditions associated with cable tray fire scenarios are bounded by the CFAST results in the GFMTs approach.

The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee provided appropriate justification for using CFAST to model fire scenarios with a Froude number outside the NUREG-1824 validated range.

3.8.3.2.3 Post-Transition

The licensee also stated that it will revise the appropriate processes and procedures to include NFPA 805 quality requirements for use during the performance of post-transition FPP changes, including those for V&V. Revision of the applicable post-transition processes and procedures to include NFPA 805 requirements for V&V is identified in Table S-3 as implementation Items 16 and 17. The NRC staff concludes that these actions are acceptable because they will incorporate the provisions of NFPA 805 in the FPP and because they would be required by the proposed license condition.

3.8.3.2.4 Conclusion for Section 3.8.3.2

Based on the licensee's description of the Turkey Point process for V&V of calculational models and numerical methods, and their continued use post-transition, the NRC staff concludes that the licensee's approach to meeting the requirements of NFPA 805, Section 2.7.3.2 is acceptable because the models are consistent with approved uses in NRC guidance or authoritative publications, peer reviewed journal articles, or national research laboratory reports, and the licensee identified actions that will result in compliance with NFPA 805, and those actions would be required by the proposed license condition.

3.8.3.3 Limitations of Use

NFPA 805, Section 2.7.3.3 requires that acceptable engineering methods and numerical models be used for applications only to the extent that these methods have been subject to V&V and

that they are applied within the scope, limitations, and assumptions prescribed for that method. The LAR stated that the engineering methods and numerical models used in support of the transition to NFPA 805 were subject to the limitations of use outlined in NFPA 805, Section 2.7.3.3, and that the engineering methods and numerical models used post-transition will be subject to these same limitations of use.

3.8.3.3.1 General

The NRC staff assessed the acceptability of each empirical correlation and fire model in terms of the limits of its use. SE Table 3.8-1 in SE Attachment A and SE Table 3.8-2 in SE Attachment B, summarize the fire models used, how each was applied in the Turkey Point FREs, the V&V basis for each, and the NRC staff evaluation for each.

3.8.3.3.2 Discussion of RAIs

In a letter dated March 15, 2013 (Reference 22), the NRC staff sought additional information (RAIs) concerning the FM conducted to support the FPRA. In letters dated March 18, 2013 (Reference 10); April 16, 2013 (Reference 11); and May 15, 2013 (Reference 12); the licensee responded to the RAIs.

- In FM RAI 04 (Reference 22), the NRC staff requested that the licensee identify any uses of the GFMTs approach outside the limits of applicability, and to explain for those cases how the use of the GFMTs approach was justified.

  In its response to FM RAI 04 (Reference 11), the licensee explained that the application of the GFMTs approach resulted in the development of supplements and enhancements to address the following limitations:

  - Application of the generic ZOI data in compartments in which the HGL temperature exceeds 80 °C;
  - Application of the generic ZOI data to wall and corner fire scenarios;
  - Application of the generic HGL data to fire scenarios that involve secondary combustibles (cable trays);
  - Application of the generic ZOI data for large panel ignition sources;
  - Application of the generic ZOI data to scenarios that result in flame impingement to the ceiling; and
  - Application of the generic HGL data for fires in compartments with a length to width ratio exceeding five.

  The licensee provided a detailed discussion for each of these enhancements, and explained how the limitations were addressed. To address the third limitation, the licensee revised the HGL tables for fires that involve secondary

combustibles (cable trays). The licensee also updated the CDF and LERF contribution accordingly.

The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee demonstrated that it used the GFMTs approach within its limits of applicability

3.8.3.3.3 Post-Transition

The licensee stated that it will revise the appropriate processes and procedures to include the NFPA 805 quality requirements for use during the performance of post-transition FPP changes, including those for limitations of use. Revision of the applicable post-transition processes and procedures to include NFPA 805 requirements for limitations of use is identified in Table S-3 as Implementation Items 16 and 17. The NRC staff concludes that these actions are acceptable because they will incorporate the provisions of NFPA 805 in the FPP and would be required by the proposed license condition.

3.8.3.3.4 Conclusion for Section 3.8.3.3

Based on the licensee's statements that the fire models used to support development of the FREs were used within their limitations, and the description of the Turkey Point process for placing limitations on the use of engineering methods and numerical models, the NRC staff concludes that the licensee's approach to meeting the requirements of NFPA 805, Section 2.7.3.3 is acceptable because the models are consistent with approved uses in NRC guidance or other authoritative publications and the licensee identified actions that will incorporate the provisions of NFPA 805 in the FPP and those actions would be required by the proposed license condition.

3.8.3.4 Qualification of Users

NFPA 805 requires that personnel performing engineering analyses and applying numerical methods (e.g., FM) be competent in that field and experienced in the application of these methods as they relate to NPPs, NPP fire protection, and power plant operations. The licensee's procedures require that cognizant personnel who use and apply engineering analyses and numerical models be competent in the field of application and experienced in the application of the methods, including those personnel performing analyses in support of compliance with 10 CFR 50.48(c).

Specifically, these requirements are being addressed through the implementation of an engineering qualification process at Turkey Point. The licensee developed procedures that require that cognizant personnel who use and apply engineering analyses and numerical models be competent in the field of application and experienced in the application of the methods, including those personnel performing analyses in support of compliance with 10 CFR 50.48(c). These requirements are being addressed through the implementation of an engineering qualification process. Turkey Point has developed qualification or training requirements for personnel performing engineering analyses and numerical methods.

3.8.3.4.1 Discussion of RAIs

In a letter dated March 15, 2013 (Reference 22), the NRC staff sought additional information (RAIs) concerning the FM conducted to support the FPRA. In letters dated March 18, 2013 (Reference 10); April 16, 2013 (Reference 11); and May 15, 2013 (Reference 12), the licensee responded to the RAIs. In a letter dated November 7, 2013 (Reference 23), the NRC sent additional RAIs to the licensee. In a letter dated January 7, 2014 (Reference 13), the licensee provided a response to the RAIs.

- In FM RAI 05.a (Reference 22), the NRC staff requested that the licensee describe the necessary qualifications of the engineers performing the FM.

  In its response to FM RAI 05.a (Reference 10), the licensee explained that the qualification requirements for the technical leads are consistent with and often exceed those described in NEI 07-12 (Reference 126), for qualification of peer reviewers, and that there are no specific qualifications for those in a support role as the assigned technical lead retained responsibility for the accuracy of the calculations performed. The licensee further stated that the GFMTs approach and MCR abandonment time calculations were performed by graduates of accepted engineering curriculums with both Bachelors and Masters degrees who are also member grade in the SFPE.

  The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee demonstrated that the engineers performing the FM have the necessary qualifications.

- In FM RAI 05.b (Reference 22), the NRC staff requested that the licensee describe the process and procedures for ensuring that the qualifications of the engineers and personnel performing the FM are adequate.

  In its response to FM RAI 05.b (Reference 10), the licensee explained that training and qualification of personnel involved in technical analysis, including FM, for the Turkey Point NFPA 805 project is addressed in a "Project/Quality Plan." The licensee also stated that consulting engineers used have an internal training and certification process in place to qualify those developing FPRAs and that the technical lead for the project is qualified to each certification guide and supervised all tasks of the FPRA including the integration of the GFMTs into the FPRA model.

  The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee demonstrated that a process and procedures are in place to ensure that the qualifications of the engineers and personnel performing the FM are adequate.

- In FM RAI 05.c (Reference 22), the NRC staff requested that the licensee describe who performed the walkdowns of the MCR and the remaining fire areas in the plant.

In its response to FM RAI 05.c (Reference 10), the licensee stated that the personnel performing the walkdown of the MCR met the qualification standards described in RG 1.189 (Reference 46), Section 1.6.1.a. The licensee further stated that the walkdowns of other areas of the plant were primarily conducted by consulting engineers under the direction of a technical lead with qualifications consistent with or exceeding those described in NEI 07-12 (Reference 126) for the qualification of a peer reviewer.

The NRC staff concludes that the licensee response to the RAI is acceptable because the licensee demonstrated that personnel who performed walkdowns were qualified in accordance with NRC-endorsed guidance.

- In FM RAI 05(d) (Reference 22), the NRC staff requested that the licensee explain the communication process between the FM analysts and PRA personnel and any measures taken to assure the FM was performed adequately and will continue to be performed adequately during post-transition.

  In its response to FM RAI 05(d) (Reference 10), the licensee stated that the coordination of technical activities between the fire analysis individuals and the risk modeling individuals was facilitated by the availability of a detailed generic FM analysis. The licensee further stated that no specific procedures or process were required for communication between the FM group and the PRA group given that the groups were integrated into a single project team. The licensee further stated that informal communications were used throughout the project when clarification was required in applying the generic FM treatments or addressing specific FM concerns outside of the treatments.

  The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee demonstrated that the FM group and the PRA group were integrated into a single project team.

- In FM RAI 05.e (Reference 22), the NRC staff requested that the licensee explain the communication process between the consulting engineers and Turkey Point personnel and any measures taken to assure the FM was performed adequately and will continue to be performed adequately during post-transition.

  In its response to FM RAI 05.e (Reference 10), the licensee stated that the communication process between the consulting engineers and the Turkey Point staff consisted of onsite and call-in project meetings that were held during the course of the NFPA 805 FPRA model transition and of reviews of draft deliverables, as applicable. The licensee further stated that meetings and reviews included consideration of the technical adequacy of the FM as applied at Turkey Point.

  The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee demonstrated a process between consulting engineers and staff engineers that ensures FM is adequately performed.

Based on its review and above explanation, the NRC staff concludes that appropriately competent and experienced personnel developed the Turkey Point FREs, including the supporting FM calculations and including the additional documentation for models and empirical correlations not identified in previous NRC-approved V&V documents.

Further, LAR Section 4.7.3, "Compliance with Quality Requirements in Section 2.7.3 of NFPA 805, Fire Protection Quality," states:

> ... Post-transition, for personnel performing fire modeling or FPRA development and evaluation, FPL will develop and maintain qualification requirements for individuals assigned various tasks. Position Specific Guides will be developed to identify and document required training and mentoring to ensure individuals are appropriately qualified per the requirements of NFPA 805, Section 2.7.3.4 to perform assigned work. ...

The post-transition qualification training program that will be implemented to include NFPA 805 requirements for qualification of users is included in implementation Item 3, which is discussed in LAR Attachment 3, Table S-3. The NRC staff concludes that this action is acceptable because it will incorporate the provisions of NFPA 805 in the FPP and because it would be required by the proposed license condition.

In addition, based on the licensee's description of the procedures for ensuring personnel who use and apply engineering analyses and numerical methods are competent and experienced, the NRC staff concludes that the licensee's approach for meeting the requirements of NFPA 805, Section 2.7.3.4 is acceptable.

3.8.3.4.2 Conclusion for Section 3.8.3.4

Based on the above discussions, the NRC staff concludes that the qualification program addresses the requirements of NFPA 805, Section 2.7.3.4, which includes personnel performing engineering analyses and applying numerical methods (e.g., FM) are competent in that field and experienced in the application of these methods as they relate to NPPs fire protection and power plant operations.

3.8.3.5 Uncertainty Analysis

NFPA 805 requires that an uncertainty analysis be performed to provide reasonable assurance that the performance criteria have been met (10 CFR 50.48(c)(2)(iv) states that an uncertainty analysis performed in accordance with NFPA 805, Section 2.7.3.5, is not required to support calculations used in conjunction with a deterministic approach). The licensee stated that an uncertainty analysis was performed for the analyses used in support of the transition to NFPA 805, and that an uncertainty analysis will be performed for post-transition analyses.

3.8.3.5.1 General

The industry consensus standard for PRA development (i.e., the ASME/ANS PRA standard, (Reference 45)) includes requirements to address uncertainty. Accordingly, the licensee

addressed uncertainty as a part of the development of the Turkey Point FREs. The NRC staff's evaluation of the licensee's treatment of these uncertainties is discussed in SE Section 3.4.7.

NUREG-1855, Volume 1, "Guidance on the Treatment of Uncertainties Associated with PRAs in RI Decision Making" (Reference 59), discusses three types of uncertainty associated with FM calculations as follows:

(1) Parameter Uncertainty: Input parameters are often chosen from statistical distributions or estimated from generic reference data. In either case, the uncertainty of these input parameters affects the uncertainty of the results of the FM analysis.

(2) Model Uncertainty: Idealizations of physical phenomena lead to simplifying assumptions in the formulation of the model equations. In addition, the numerical solution of equations that have no analytical solution can lead to inexact results. Model uncertainty is estimated via the processes of V&V. An extensive discussion of quantifying model uncertainty can be found in NUREG-1934, "Nuclear Power Plant Fire Modeling Application Guide (NPP FIRE MAG)" (Reference 61).

(3) Completeness Uncertainty: This refers to the fact that a model is not a complete description of the phenomena it is designed to simulate. Some consider this a form of model uncertainty because most fire models neglect certain physical phenomena that are not considered important for a given application. Completeness uncertainty is addressed by the description of the algorithms found in the model documentation. It is addressed indirectly by the same process used to address the Model Uncertainty.

3.8.3.5.2 Discussion of RAIs

In a letter dated March 15, 2013 (Reference 22), the NRC staff sought additional information (RAIs) concerning the FM conducted to support the FPRA. In letters dated March 18, 2013 (Reference 10); April 16, 2013 (Reference 11); and May 15, 2013 (Reference 12), the licensee responded to the RAIs. In a letter dated November 7, 2013 (Reference 23), the NRC sent additional RAIs to the licensee. In a letter dated January 7, 2014 (Reference 13), the licensee provided a response to the RAIs.

- In FM RAI 06.a (Reference 22), the NRC staff requested that the licensee explain how the uncertainty associated with the fire model input parameters was accounted for in the FM analyses.

  In its response to FM RAI 06.a (Reference 11), the licensee stated that the uncertainty associated with the fire model input parameters is addressed through the use of a conservative and bounding analysis. The licensee provided a detailed discussion of the approach for the three primary FM activities where parameter uncertainty is applicable as follows: (1) the MCR abandonment analysis, (2) the ZOI tabulations in the GFMTs approach, and (3) the HGL tabulations in the GFMTs approach.

The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee demonstrated that FM parameter uncertainty is properly accounted for in the FM analysis through the use of a conservative and bounding analysis.

- In FM RAI 06.b (Reference 22), the NRC staff requested that the licensee explain how the "model" uncertainty was accounted for in the FM analyses.

  In its response to FM RAI 06.b (Reference 11), the licensee stated that "model" uncertainty is addressed through the use of a conservative and bounding analysis. The licensee provided a detailed discussion to show that, depending on the condition causing abandonment, the model uncertainty in the MCR abandonment analysis either does not contribute to the risk uncertainty or is bounded by the conservatisms in the analysis. In the response, the licensee also showed that fire model uncertainty in the GFMTs ZOI and HGL tabulations does not contribute significantly to the risk uncertainty since it is sufficiently bound by the conservatisms in the ZOI and HGL analyses.

  The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee demonstrated that the model uncertainty is properly accounted for in the FM analysis. This is because it either does not contribute to the risk uncertainty or is bounded by the conservatisms in the analysis.

- In FM RAI 06.c (Reference 22), the NRC staff requested that the licensee explain how the "completeness" uncertainty was accounted for in the FM analyses.

  In its response to FM RAI 06.c (Reference 11), the licensee explained that according to NUREG-1934 (Reference 61), the "model" uncertainty and the "completeness" uncertainty are related and may be combined. The licensee further stated that the fire model "completeness" uncertainty and the "model" uncertainty were addressed as a single source of uncertainty.

- The NRC staff concludes that the licensee response to the RAI is acceptable because the licensee demonstrated that completeness uncertainty is properly accounted for in the FM analysis because it was combined with the model uncertainty in accordance with NUREG-1934.

3.8.3.5.3 Post-Transition

The licensee stated that it will revise the appropriate processes and procedures to include the NFPA 805 quality requirements for use during the performance of post-transition FPP changes, including those regarding uncertainty analysis. Revision of the applicable post-transition processes and procedures to include NFPA 805 requirements regarding uncertainty analysis are identified in LAR Attachment S, Table S-3 as Implementation Items 16 and 17. The NRC staff concludes that these actions are acceptable because they will incorporate the provisions of NFPA 805 in the FPP and would be required by the proposed license condition.

3.8.3.5.4 Conclusion for Section 3.8.3.5

Based on the licensee's description of the process for performing an uncertainty analysis, the NRC staff concludes that the licensee's approach for meeting the requirements of NFPA 805, Section 2.7.3.5 is acceptable.

3.8.3.6 Conclusion for Section 3.8.3

Based on the above discussions, the NRC staff concludes that the RI/PB fire protection quality assurance (QA) program adequately addresses each of the requirements of NFPA 805, Section 2.7.3, which include conducting independent reviews, performing V&V, limiting the application of acceptable methods and models to within prescribed boundaries, ensuring that personnel applying acceptable methods and models are qualified, and performing uncertainty analyses.

3.8.4 Fire Protection Quality Assurance Program

GDC 1 of Appendix A to 10 CFR Part 50 states:

> Structures, systems, and components important to safety shall be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety functions to be performed.

The guidance in Appendix C to NEI 04-02 (Reference 7), suggests that the LAR include a description of how the existing fire protection QA program will be transitioned to the new NFPA 805 RI/PB FPP, as discussed below.

In LAR Section 4.7.3, the licensee stated that it will maintain the existing fire protection quality assurance program and that during the transition to 10 CFR 50.48(c), it performed work in accordance with the quality requirements of Section 2.7.3 of NFPA 805. The LAR described how the fire protection QA program meets the applicable requirements of NFPA 805 Sections 2.7.3.1 through 2.7.3.5, but indicated that the QA program would be updated to meet the applicable requirements of NFPA 805 Section 2.7.3.4. The licensee included an action to develop position specific guides to identify and document required training and mentoring to ensure individuals are appropriately qualified in accordance with NFPA 805, Section 2.7.3.4 in LAR Attachment S, Table S-3, Implementation Item 16. The NRC staff concludes that this action is acceptable because it will incorporate the provisions of NFPA 805 in the FPP and because it would be required by the proposed license condition.

Based on its review and the above explanation, the NRC staff concludes that the licensee's fire protection QA program is acceptable, subject to completion of the implementation item, because it provides reasonable assurance that the requirements of NFPA 805, Section 2.7.3.1 through 2.7.3.5 are met.

3.8.5 Conclusion for Section 3.8

The NRC staff reviewed the licensee's RI/PB FPP as described in the LAR, as supplemented, to evaluate the NFPA 805 program documentation content, the associated configuration control

process, and the appropriate QA requirements. The NRC staff concludes that, subject to completion of the implementation items related to the QA program, the licensee's approach for meeting the requirements specified in NFPA 805, Section 2.7 is acceptable.

4.0 FIRE PROTECTION LICENSE CONDITION

The licensee proposed an FPP license condition regarding transition to an RI/PB FPP under NFPA 805, in accordance with 10 CFR 50.48(c)(3)(i). The new license condition adopts the guidelines of the standard fire protection license condition promulgated in RG 1.205, Revision 1, Regulatory Position C.3.1, as issued on December 18, 2009 (74 FR 67253). Plant-specific changes were made to the sample license condition. However, the proposed plant-specific FPP license condition is consistent with the standard fire protection license condition; incorporates all of the relevant features of the transition to NFPA 805 at Turkey Point Nuclear Generating Station, Unit Nos. 3 and 4; and the NRC staff concludes that it is acceptable.

The following license condition is included in the revised licenses and will replace Renewed Facility Operating License Nos. DPR-31 and DPR-41, Condition 3.D:

> Fire Protection
>
> FPL shall implement and maintain in effect all provisions of the approved fire protection program that comply with 10 CFR 50.48(a) and 10 CFR 50.48(c), as specified in the licensee amendment request dated June 28, 2012 (and supplements dated September 19, 2012; March 18, April 16, and May 15, 2013; January 7, April 4, June 6, July 18, September 12, November 5, and December 2, 2014; and February 18, 2015), and as approved in the safety evaluation dated [Month Day, 2015]. Except where NRC approval for changes or deviations is required by 10 CFR 50.48(c), and provided no other regulation, technical specification, license condition or requirement would require prior NRC approval, the licensee may make changes to the fire protection program without prior approval of the Commission if those changes satisfy the provisions set forth in 10 CFR 50.48(a) and 10 CFR 50.48(c), the change does not require a change to a technical specification or a license condition, and the criteria listed below are satisfied.
>
> (a) Risk-Informed Changes that May Be Made Without Prior NRC Approval
>
> A risk assessment of the change must demonstrate that the acceptance criteria below are met. The risk assessment approach, methods, and data shall be acceptable to the NRC and shall be appropriate for the nature and scope of the change being evaluated; be based on the as-built, as-operated, and maintained plant; and reflect the operating experience at the plant. Acceptable methods to assess the risk of the change may include methods that have been used in the peer-reviewed fire PRA model, methods that have been approved by NRC through a plant-specific license amendment or NRC approval of generic methods specifically for use in NFPA 805 risk assessments, or methods that have been demonstrated to bound the risk impact.
>
> 1. Prior NRC review and approval is not required for changes that clearly result in a decrease in risk. The proposed change must also be

consistent with the defense-in-depth philosophy and must maintain sufficient safety margins. The change may be implemented following completion of the plant change evaluation.

2. Prior NRC review and approval is not required for individual changes that result in a risk increase less than 1×10-7/year (yr) for CDF and less than 1×10-8/yr for LERF. The proposed change must also be consistent with the defense-in-depth philosophy and must maintain sufficient safety margins. The change may be implemented following completion of the plant change evaluation.

(b) Other Changes that May be Made Without Prior NRC Approval

1. Changes to NFPA 805, Chapter 3, Fundamental Fire Protection Program

Prior NRC review and approval are not required for changes to the NFPA 805, Chapter 3, fundamental fire protection program elements and design requirements for which an engineering evaluation demonstrates that the alternative to the Chapter 3 element is functionally equivalent or adequate for the hazard. The licensee may use an engineering evaluation to demonstrate that a change to an NFPA 805, Chapter 3, element is functionally equivalent to the corresponding technical requirement. A qualified fire protection engineer shall perform the engineering evaluation and conclude that the change has not affected the functionality of the component, system, procedure, or physical arrangement, using a relevant technical requirement or standard.

The licensee may use an engineering evaluation to demonstrate that changes to certain NFPA 805, Chapter 3, elements are acceptable because the alternative is "adequate for the hazard." Prior NRC review and approval would not be required for alternatives to four specific sections of NFPA 805, Chapter 3, for which an engineering evaluation demonstrates that the alternative to the Chapter 3 element is adequate for the hazard. A qualified fire protection engineer shall perform the engineering evaluation and conclude that the change has not affected the functionality of the component, system, procedure, or physical arrangement, using a relevant technical requirement or standard. The four specific sections of NFPA 805, Chapter 3, are as follows:

- "Fire Alarm and Detection Systems" (Section 3.8);
- "Automatic and Manual Water-Based Fire Suppression Systems" (Section 3.9);
- "Gaseous Fire Suppression Systems" (Section 3.10); and
- "Passive Fire Protection Features" (Section 3.11).

This License Condition does not apply to any demonstration of equivalency under Section 1.7 of NFPA 805.

2. Fire Protection Program Changes that Have No More than Minimal Risk Impact

Prior NRC review and approval are not required for changes to the licensee's fire protection program that have been demonstrated to have no more than a minimal risk impact. The licensee may use its screening process as approved in the NRC safety evaluation dated [Month Day, 2015] to determine that certain fire protection program changes meet the minimal criterion. The licensee shall ensure that fire protection defense-in-depth and safety margins are maintained when changes are made to the fire protection program.

(c) Transition License Conditions

1. Before achieving full compliance with 10 CFR 50.48(c), as specified by 2. and 3. below, risk-informed changes to the licensee's fire protection program may not be made without prior NRC review and approval unless the change has been demonstrated to have no more than a minimal risk impact, as described in 2. above.

2. The licensee shall implement the modifications to its facility, as described in Enclosure 1, Attachment S, Table S-2, "Plant Modifications Committed," of FPL letter L-2014-303, dated November 5, 2014, to complete the transition to full compliance with 10 CFR 50.48(c) by the end of the second refueling outage (for each unit) following issuance of the license amendment. The licensee shall maintain appropriate compensatory measures in place until completion of these modifications.

3. The licensee shall implement the items listed in Enclosure 1, Attachment S, Table S-3, "Implementation Items," of FPL letter L-2014-303, dated November 5, 2014, with the exception of Items 12, 18, 19, and 22 no later than 12 months after issuance of the license amendment. Items 12, 18, and 19 are associated with modifications in Table S-2 and will be completed in accordance with Transition License Condition 2 above. Item 22 will be completed within 6 months of the NRC approval of the Flowserve RCP Seal Topical Report.

5.0 SUMMARY

The NRC staff reviewed the licensee's application, as supplemented by various letters, to transition to an RI/PB FPP in accordance with the requirements established by NFPA 805. The NRC staff concludes that, subject to completion of the modifications and implementation items in LAR Attachment S, the applicant's approach, methods, and data are acceptable to establish, implement and maintain an RI/PB FPP in accordance with 10 CFR 50.48(c).

Accordingly, implementation of the RI/PB FPP in accordance with 10 CFR 50.48(c) is reflected by a new fire protection license condition, which identifies the list of implementation items that must be completed in order to support the conclusions made in this SE, and establishes a date

by which full compliance with 10 CFR 50.48(c) will be achieved. Before the licensee is able to fully implement the transition to an FPP based on NFPA 805 and apply the new fire protection license condition, to its full extent, the implementation items must be completed within the timeframe specified.

6.0 STATE CONSULTATION

In accordance with the Commission's regulations, the NRC staff notified the State of Florida official (Ms. Cynthia Becker, M.P.H., Chief of the Bureau of Radiation Control, Florida Department of Health) on March 9, 2015, of the proposed issuance of the amendments. The State official had no comments.

7.0 ENVIRONMENTAL CONSIDERATION

The amendments change a requirement with respect to the installation or use of facility components located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendments involve no significant increase in the amounts and no significant change in the types of any effluents that may be released offsite and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendments involve no significant hazards consideration, and there has been no public comment on such finding published in the FR on February 4, 2014 (79 FR 6648). Accordingly, the amendments meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendments.

8.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above that (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner; (2) there is reasonable assurance that such activities will be conducted in compliance with the Commission's regulations; and (3) the issuance of the amendments will not be inimical to the common defense and security or to the health and safety of the public.

9.0 REFERENCES

1 Branch Technical Position APCSB 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants" (ADAMS Accession No. ML070660461).

2 Appendix A to Branch Technical Position APCSB 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants Docketed Prior to July 1, 1976" (ADAMS Accession No. ML070660458).

3 National Fire Protection Association Standard 805 (NFPA 805), "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants," 2001 Edition, Quincy, Massachusetts.

4 U.S. Nuclear Regulatory Commission, Regulatory Guide 1.205, "Risk-Informed, Performance-Based Fire Protection for Existing Light-Water Nuclear Power Plants," Revision 1, December 2009 (ADAMS Accession No. ML092730314).

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Principal Contributors:

NRC/NRR:
Jay Robinson, Paul Lain, Steve Dinsmore, Charles Moulton, Thinh Dinh, Ray Gallucci, Roger Pederson

Pacific Northwest National Laboratories –
Robert Layton, Garill Coles, William Ivans

Center for Nuclear Waste Regulatory Analyses –
Marc Janssens, Jason Huczek, Eric Nette, Robert Fosdick

Date: May 28, 2015

Attachments:

A. Table 3.8-1 - V&V Basis for Fire Modeling Correlations Used at Turkey Point
B. Table 3.8-2 - V&V Basis for Fire Modeling Calculations of Other Models Used at Turkey Point
C. Abbreviations and Acronyms

Table 3.8-1, V&V Basis for Fire Modeling Correlations Used at Turkey Point

Correlation	Application at Turkey Point	V&V Basis	NRC Staff Evaluation of Acceptability
Heskestad flame height correlation	Development of ZOI tables in GFMTs approach	NUREG-1805 (Reference 56) NUREG-1824 (Reference 57) SFPE Handbook (Reference 110)	• The licensee provided verification of the coding of this correlation in the GFMTs approach (LAR, Attachment J, "Fire Modeling V&V"). • The correlation is validated in NUREG-1824 and an authoritative publication. • The licensee stated that in most cases, the correlation has been applied within the validated range reported in NUREG-1824. The licensee provided justification for cases where it used the correlation outside the validated range reported in NUREG-1824 (Response to FM RAI 04, (Reference 11). Based on its review and the licensee's explanation, the NRC staff concludes that the use of this correlation in the Turkey Point application is acceptable.
Heskestad plume temperature correlation	Development of ZOI tables in GFMTs approach	NUREG-1805 (Reference 56) NUREG-1824 (Reference 57) SFPE Handbook (Reference 110)	• The licensee provided verification of the coding of this correlation in the GFMTs approach (LAR, Attachment J). • The correlation is validated in NUREG-1824 and an authoritative publication. • The licensee stated that in most cases, the correlation has been applied within the validated range reported in NUREG-1824. The licensee provided justification for cases where it used the correlation outside the validated range reported in NUREG-1824 (Response to FM RAI 04, (Reference 11). Based on its review and the licensee's explanation, the NRC staff concludes that the use of this correlation in the Turkey Point application is acceptable.

Table 3.8-1, V&V Basis for Fire Modeling Correlations Used at Turkey Point

Correlation	Application at Turkey Point	V&V Basis	NRC Staff Evaluation of Acceptability
Modak point source radiation model	Development of ZOI tables in GFMTs approach	NUREG-1805 (Reference 56) NUREG-1824 (Reference 57) SFPE Handbook (Reference 127)	• The licensee provided verification of the coding of this correlation in the GFMTs approach (LAR, Attachment J). • The correlation is validated in NUREG-1824 and an authoritative publication. • The licensee stated that in most cases, the correlation has been applied within the validated range reported in NUREG-1824. The licensee provided justification for cases where it used the correlation outside the validated range reported in NUREG-1824 (Response to FM RAI 04, (Reference 11). Based on its review and the licensee's explanation, the NRC staff concludes that the use of this correlation in the Turkey Point application is acceptable.
Shokri and Beyler flame radiation model	Development of ZOI tables in GFMTs approach	Peer-reviewed journal article (Reference 111)	• The licensee provided verification of the coding of this correlation in the GFMTs approach (LAR, Attachment J). • The correlation is validated in a peer reviewed journal article. • The licensee stated that in most cases, the correlation has been applied within the validated range reported in the authoritative publication. The licensee provided justification for cases where it used the correlation outside the reported validated range (Response to FM RAI 04, (Reference 11). Based on its review and the licensee's explanation, the NRC staff concludes that the use of this correlation in the Turkey Point application is acceptable.

Table 3.8-1, V&V Basis for Fire Modeling Correlations Used at Turkey Point

Correlation	Application at Turkey Point	V&V Basis	NRC Staff Evaluation of Acceptability
Mudan flame radiation model	Development of ZOI tables in GFMTs approach	Peer-reviewed journal article (Reference 113)	• The licensee provided verification of the coding of this correlation in the GFMTs approach (LAR, Attachment J). • The correlation is validated in a peer reviewed journal article. • The licensee stated that in most cases, the correlation has been applied within the validated range reported in the authoritative publication. The licensee provided justification for cases where it used the correlation outside the reported validated range (Response to FM RAI 04, (Reference 11). Based on its review and the licensee's explanation, the NRC staff concludes that the use of this correlation in the Turkey Point application is acceptable.
Plume heat flux correlation by Wakamatsu et al.	Development of ZOI tables in GFMTs approach	Peer-reviewed conference paper (Reference 114)	• The licensee provided verification of the coding of this correlation in the GFMTs approach (LAR, Attachment J). • The correlation is validated in a peer reviewed conference paper. • The licensee stated that in most cases, the correlation has been applied within the validated range reported in the authoritative publication. The licensee provided justification for cases where it used the correlation outside the reported validated range (Response to FM RAI 04, (Reference 11). Based on its review and the licensee's explanation, the NRC staff concludes that the use of this correlation in the Turkey Point application is acceptable.

Table 3.8-1, V&V Basis for Fire Modeling Correlations Used at Turkey Point

Correlation	Application at Turkey Point	V&V Basis	NRC Staff Evaluation of Acceptability
Yokoi plume centerline temperature correlation	Development of ZOI tables in GFMTs approach	National research laboratory report (Reference 115) Peer-reviewed journal article (Reference 116)	• The licensee provided verification of the coding of this correlation in the GFMTs approach (LAR, Attachment J). • The correlation is validated a national research laboratory report and a peer reviewed journal article. • The licensee stated that in most cases, the correlation has been applied within the validated range reported in the authoritative publication. The licensee provided justification for cases where it used the correlation outside the reported validated range (Response to FM RAI 04, (Reference 11). Based on its review and the licensee's explanation, the NRC staff concludes that the use of this correlation in the Turkey Point application is acceptable.
Hydrocarbon spill fire size correlation	Development of ZOI tables in GFMTs approach	SFPE Handbook (Reference 117)	• The licensee provided verification of the coding of this correlation in the GFMTs approach (LAR, Attachment J). • The correlation is validated in an authoritative publication. • The licensee stated that in most cases, the correlation has been applied within the validated range reported in the authoritative publication. The licensee provided justification for cases where it used the correlation outside the reported validated range (Response to FM RAI 04, (Reference 11). Based on its review and the licensee's explanation, the NRC staff concludes that the use of this correlation in the Turkey Point application is acceptable.

Table 3.8-1, V&V Basis for Fire Modeling Correlations Used at Turkey Point

Correlation	Application at Turkey Point	V&V Basis	NRC Staff Evaluation of Acceptability
Flame extension correlation	Development of ZOI tables in GFMTs approach	SFPE Handbook (Reference 118)	• The licensee provided verification of the coding of this correlation in the GFMTs approach (LAR, Attachment J). • The correlation is validated in an authoritative publication. • The licensee stated that in most cases, the correlation has been applied within the validated range reported in the authoritative publication. The licensee provided justification for cases where it used the correlation outside the reported validated range (Response to FM RAI 04, (Reference 11). Based on its review and the licensee's explanation, the NRC staff concludes that the use of this correlation in the Turkey Point application is acceptable.
Delichatsios line source flame height model	Development of ZOI tables in GFMTs approach	Peer-reviewed journal article (Reference 119)	• The licensee provided verification of the coding of this correlation in the GFMTs approach (LAR, Attachment J). • The correlation is validated in a peer reviewed journal article. • The licensee stated that in most cases, the correlation has been applied within the validated range reported in the authoritative publication. The licensee provided justification for cases where it used the correlation outside the reported validated range (Response to FM RAI 04, (Reference 11). Based on its review and the licensee's explanation, the NRC staff concludes that the use of this correlation in the Turkey Point application is acceptable.

Table 3.8-1, V&V Basis for Fire Modeling Correlations Used at Turkey Point

Correlation	Application at Turkey Point	V&V Basis	NRC Staff Evaluation of Acceptability
Corner flame height correlation	Development of ZOI tables in GFMTs approach	SFPE Handbook (Reference 118)	• The licensee provided verification of the coding of this correlation in the GFMTs approach (LAR, Attachment J), and (Response to FM RAI 04, Reference 9). • The correlation is validated in an authoritative publication. • The licensee stated that in most cases, the correlation has been applied within the validated range reported in the authoritative publication. The licensee provided justification for cases where it used the correlation outside the reported validated range (Response to FM RAI 04, (Reference 11). Based on its review and the licensee's explanation, the NRC staff concludes that the use of this correlation in the Turkey Point application is acceptable.
Kawagoe natural vent flow equation	Development of ZOI tables in GFMTs approach	National research laboratory report (Reference 120)	• The licensee provided verification of the coding of this correlation in the GFMTs approach (LAR, Attachment J). • The correlation is validated in a national research laboratory report. • The licensee stated that in most cases, the correlation has been applied within the validated range reported in the authoritative publication. The licensee provided justification for cases where it used the correlation outside the reported validated range (Response to FM RAI 04, (Reference 11). Based on its review and the licensee's explanation, the NRC staff concludes that the use of this correlation in the Turkey Point application is acceptable.

Table 3.8-1, V&V Basis for Fire Modeling Correlations Used at Turkey Point

Correlation	Application at Turkey Point	V&V Basis	NRC Staff Evaluation of Acceptability
Yuan and Cox line fire flame height and plume temperature correlations	Development of ZOI tables in GFMTs approach	Peer-reviewed journal article (Reference 121)	• The licensee provided verification of the coding of this correlation in the GFMTs approach (LAR, Attachment J). • The correlation is validated in a peer reviewed journal article. • The licensee stated that in most cases, the correlation has been applied within the validated range reported in the authoritative publication. The licensee provided justification for cases where it used the correlation outside the reported validated range (Response to FM RAI 04, (Reference 11). Based on its review and the licensee's explanation, the NRC staff concludes that the use of this correlation in the Turkey Point application is acceptable.
Lee cable fire model	Development of ZOI tables in GFMTs approach	NBSIR 85-3196 (Reference 122)	• The licensee provided verification of the coding of this correlation in the GFMTs approach (LAR, Attachment J). • The correlation is validated in a national research laboratory report. • The licensee stated that in most cases, the correlation has been applied within the validated range reported in the authoritative publication. The licensee provided justification for cases where it used the correlation outside the reported validated range (Response to FM RAI 04, (Reference 11). Based on its review and the licensee's explanation, the NRC staff concludes that the use of this correlation in the Turkey Point application is acceptable.

Table 3.8-1, V&V Basis for Fire Modeling Correlations Used at Turkey Point

Correlation	Application at Turkey Point	V&V Basis	NRC Staff Evaluation of Acceptability
Babrauskas method to determine ventilation-limited fire size	Development of ZOI tables in GFMTs approach	Peer-reviewed journal article (Reference 123)	• The licensee provided verification of the coding of this correlation in the GFMTs approach (LAR, Attachment J). • The correlation is validated in a peer reviewed journal article. • The licensee stated that in most cases, the correlation has been applied within the validated range reported in the authoritative publication. The licensee provided justification for cases where it used the correlation outside the reported validated range (Response to FM RAI 04, (Reference 11). Based on its review and the licensee's explanation, the NRC staff concludes that the use of this correlation in the Turkey Point application is acceptable.

Table 3.8-2, V&V Basis for Other Fire Models and Related Calculations Used at Turkey Point

Model	Application at Turkey Point	V&V Basis	NRC Staff Evaluation of Acceptability
CFAST (Version 6)	Development of GFMTs HGL tables and MCR abandonment time calculations	NUREG-1824, Volume 5, 2007 (Reference 57) NIST Special Publication 1086, 2008 (Reference 128)	• The modeling technique is validated in NUREG-1824 and a national research laboratory report. • The licensee stated that in most cases, the correlation has been applied within the validated range reported in NUREG-1824. The licensee provided justification for cases where it used the correlation outside the validated range reported in NUREG-1824 (LAR, Attachment J). Based on its review and the licensee's explanation, the NRC staff concludes that the use of this model in the Turkey Point application is acceptable.
Flame Spread over Horizontal Cable Trays FLASH-CAT Correlation	The FLASH-CAT Correlation was used to determine predict the growth and spread of a fire within a vertical stack of horizontal cable trays.	NUREG/CR-7010, Section 9 (Reference 58)	• The licensee provided verification of the coding of this model in the reports for which this model is used (Response to FM RAI 01.01, (Reference 13)). • The modeling technique is validated in NUREG/CR-7010. Based on its review and the licensee's explanation, the NRC staff concludes that the use of this model in the Turkey Point application is acceptable.

Abbreviations and Acronyms

ADAMS	Agencywide Documents Access and Management System
ADV	atmospheric dump valve
AFD	aspirating fire detector
AFW	auxiliary feedwater
AHJ	authority having jurisdiction
ANS	American Nuclear Society
ANSI	American National Standards Institute
APCSB	Auxiliary and Power Conversion Systems Branch
ASME	American Society of Mechanical Engineers
ASP	alternate shutdown panel
ASTM	American Society for Testing and Materials
BTP	Branch Technical Position
BWR	boiling-water reactor
CC	Capability Categories
CCDP	conditional core damage probability
CCF	common-cause failure
CCW	component cooling water
CDF	core damage frequency
CFAST	consolidated model of fire and smoke transport
CFR	Code of Federal Regulations
CHRISTIFIRE	Cable Heat Release, Ignition, and Spread in Tray Installations During Fire
CPT	control power transformer
CRS	control room supervisor
CSD	cold shutdown
CSR	Cable Spreading Room
CST	condensate storage tank
°F	degrees Fahrenheit
DC	direct current
DID	defense-in-depth
DID RA	defense-in-depth recovery action
ECA	equipment cabinet area
EDG	emergency diesel generator
EEEE	existing engineering equivalency evaluation
EPRI	Electric Power Research Institute
ERFBS	electrical raceway fire barrier system
F&O	fact and observation
FAQ	frequently asked question
FCV	flow control valve
FDT	fire dynamics tool
FLASH-CAT	Flame Spread over Horizontal Cable Trays
FM	fire modeling
FMDB	fire modeling database
FPE	fire protection engineering
FPL	Florida Power & Light Company
FPP	fire protection program
FPRA	fire probabilistic risk assessment

FR	Federal Register
FRE	fire risk evaluation
FSAR	final safety analysis report
ft.	foot/feet
GDC	General Design Criterion/Criteria
GFMT	generic fire modeling treatment
GL	generic letter
HDPE	high-density polyethylene
HEAF	high-energy arcing fault
HEP	human error probability
HFE	human failure event
HGL	hot gas layer
HRA	human reliability analysis
HRE	high(er) risk evolution
HRR	heat release rate
HSD	hot shutdown
HVAC	heating, ventilation, and air conditioning
IN	information notice
IEEE	Institute of Electrical and Electronics Engineers
IEPRA	internal events probabilistic risk assessment
IN	Information Notice
KSF	Key Safety Function
kW	kilowatt
LAR	license amendment request
LERF	large early release frequency
LOCA	loss-of-coolant accident
MCA	multi-compartment analysis
MCB	main control board
MCC	motor control center
MCR	main control room
MOV	motor operated valve
MSO	multiple spurious operations
NEI	Nuclear Energy Institute
NFPA	National Fire Protection Association
NIST	National Institute of Standards and Technology
NPO	non-power operation
NPP	nuclear power plant
NRC	U.S. Nuclear Regulatory Commission
NRR	Office of Nuclear Reactor Regulation
NSCA	nuclear safety capability assessment
NSP	nuclear safety performance
NSPC	nuclear safety performance criteria
OMA	operator manual action
PAU	physical analysis unit
PB	performance-based
PCE	plant change evaluation
PCS	primary control station
PE	polyethylene

PORV	power-operated relief valve
PRA	probabilistic risk assessment
PSA	probabilistic safety assessment
psig	pounds per square inch gauge
PVC	polyvinyl chloride
PWR	pressurized-water reactor
QA	quality assurance
RA	recovery action
RAI	request for additional information
RCA	Radiologically Controlled Area
RCP	reactor coolant pump
RCS	reactor coolant system
RES	Office of Nuclear Regulatory Research
RG	Regulatory Guide
RHR	residual heat removal
RI	risk-informed
RI/PB	risk-informed, performance-based
RWST	refueling water storage tank
SE	safety evaluation
SER	safety evaluation report
SFPE	Society of Fire Protection Engineers
SR	supporting requirement
SSA	safe shutdown analysis
SSC	structures, systems, and components
SSD	safe shutdown
TR	Technical/Topical Report
TS	technical specifications
UAM	unreviewed analysis method
UFSAR	Updated Final Safety Analysis Report
V&V	verification and validation
VCT	volume control tank
VEWFDS	Very Early Warning Fire Detection Systems
VFDR	variance from deterministic requirements
WOG	Westinghouse Owners Group
yr	year
ZOI	zone of influence

The NRC staff's safety evaluation of the amendments is enclosed. A Notice of Issuance will be included in the Commission's biweekly *Federal Register* notice.

Sincerely,

/RA/

Audrey L. Klett, Project Manager
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-250 and 50-251

Enclosures:
1. Amendment No. 262 to DPR-31
2. Amendment No. 257 to DPR-41
3. Safety Evaluation

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